Medical Ethics Education: Where Are We? Where Should We Be Going? A Review

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Abstract

Purpose

The authors' primary goal was to provide a comprehensive and current review of the literature surrounding ethics education for medical students. Following this review, the authors summarize the deficits in the current literature and provide recommendations for future inquiries on medical ethics education.

Method

In 2004, the authors searched MEDLINE and PubMed using the following search terms: ethics, ethics education, medical ethics education, curriculum, undergraduate medical education, virtue, role model, philosophy of medicine, and outcomes research. No limit was placed on dates for this literature search. Articles whose primary focus was professionalism were excluded because the professionalism literature tends to focus on competencies and postgraduate education, whereas the primary focus of this study was on undergraduate education. Literature on physicians as role models to medical students as a form of teaching medical ethical ethics

was excluded as well because the current discussion examines the formal undergraduate medical ethics curricula. Also excluded were reports from foreign countries (unless there were no equivalent studies in the United States). The authors found almost no literature exploring students' backgrounds (cultural, religious, socioeconomic, etc.) and the teaching of medical ethics in medical schools. Otherwise, the authors reviewed everything they could find, regardless of imperfections in individual reports such as small sample size or poor research methodology.

Results

The review, which encompassed articles from 1978 to 2004, revealed that deep shortcomings exist in the literature on medical ethics education. Deficits exist in all areas of the literature: (1) theoretical work done on the overall goals of medical ethics education; (2) empirical studies that attempt to examine outcomes for students; (3) studies examining teaching methods in medical ethics education, and (4) studies

evaluating the effectiveness of various teaching methods.

Conclusions

There are substantial opportunities for contribution to the literature on medical ethics education in all of the areas where deficits exist. The literature suggests that two points of view exist regarding the purpose of teaching medical ethics: (1) that it is a means of creating virtuous physicians; and (2) that it is a means of providing physicians with a skill set for analyzing and resolving ethical dilemmas. This dichotomy made it difficult to arrive at a consensus regarding the goals of medical ethics education. The field would benefit from further theoretical work aimed at better delineating the core content, core processes, and core skills relevant to the ethical practice of medicine. The time has come to organize an effort to improve and validate medical ethics education. In the end, effective medical ethics education will further the goals of medicine in dramatic and tangible ways.

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In the past three decades, medical ethics has emerged as a priority within medical education institutions and among ethics educators.[1] Many factors accounted for this emergence in society generally and in U.S. medical schools in particular, including: major developments in science and technology, especially advances in medical, surgical and intensive care;[2] significant societal changes in the 1960s, including the rise of the women's and civil rights movements; a better-educated public; and an increasing distrust of authority.[3–5] Although it is a recent

phenomenon, all medical schools in the United States now require that ethics be included in the undergraduate curriculum.[6,7]

Despite this widespread adoption of medical ethics curricula and the publication of several helpful reviews on ethics education,[1,5,7] many questions still remain about the nature, goals, and outcomes of these programs: What is the purpose of medical ethics education? What outcomes of ethics education should be evaluated? How should they be evaluated? What is the optimal way to teach medical ethics to medical students? To help answer these and related questions, this report offers a comprehensive and current review of the literature surrounding ethics education in the undergraduate medical school

curriculum in the United States, specifically recent literature that:

- describes medical ethics curricula.
- discusses the goals of medical ethics education.
- describes empirical research on the outcomes of medical ethics education.
- examines teaching methods in medical ethics education.
- examines evaluation methods in medical ethics education.

Included in the literature about some of the topics above are proposals for implementing medical ethics in the curriculum.

Following this review, we summarize the deficits in the current literature and provide recommendations for future inquiry on medical ethics education. Our

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discussion focuses principally on medical ethics curricula in U.S. medical schools, with brief coverage of programs in Canada and the United Kingdom.

Method

In 2004, we searched MEDLINE and PubMed using the following search terms: *ethics, ethics education, medical ethics education, curriculum, undergraduate medical education, virtue, role model, philosophy of medicine,* and *outcomes research. Virtue* was chosen as a search term because of extensive medical ethics literature on virtue in medicine, the virtuous physician, and virtue as a goal of medical ethics education. No limit was placed on dates for this literature search. We searched the bibliographies of articles identified in the initial search for relevant literature not found in the electronic search. We excluded articles whose primary focus was professionalism. Although there is some overlap within the literatures concerning ethics education and professionalism, the professionalism literature tends to focus on competencies and postgraduate education, whereas our primary focus is on undergraduate education. Literature on physicians as role models to medical students as a form of teaching medical ethical ethics was excluded as well because the current discussion examines the formal undergraduate medical ethics curricula. We also excluded reports from foreign countries (unless there were no equivalent studies in the United States). To our knowledge, almost no literature exists exploring students' backgrounds (cultural, religious, socioeconomic, etc.) and the teaching of medical ethics in medical schools. Because this is a review of the literature, there is no discussion about these issues in this report. Except for the exclusions noted, we reviewed everything available to our knowledge, regardless of imperfections in individual reports such as small sample size or poor research methodology.

Results

In all, 100 articles and three books were retrieved; of these, 59 were reviewed for this report. The oldest was published in 1978 and the newest was published in 2004; most were published after 1990. The selected publications were classified according to their focus: descriptive studies of medical ethics curricula, goals of medical ethics education, empirical studies regarding outcomes of medical ethics education, articles that examine teaching methods and evaluation in medical ethics education, and articles providing recommendations for future implementation of medical ethics education. In the following sections, we review the literature in each of these categories.

Descriptions of medical ethics curricula

Although there is a substantial body of work on what ethics education should be within the medical school curriculum (which will be discussed in a subsequent section), only five descriptive studies of ethics curricula were identified.

In 1987, Calman and Downie described their experience and outcomes with the development of an experimental ethics program at the University of Glasgow Medical School.[8] They conclude that "to achieve credibility in the eyes of the student population it is suggested that some form of assessment or examination is required."[8] This study is nearly 20 years old; since that time, all U.S. medical schools have implemented ethics curricula.

Silverberg,[9] DuBois and Burkemper,[10] and Lehmann et al.[11] conducted mail survey studies in which they analyzed the teaching methods and content of medical ethics programs. Silverberg (in 2000) sent a questionnaire to 118 U.S. allopathic and 16 osteopathic medical schools, asking four questions: (1) Does your medical school have a formal required course in medical ethics? (2) Approximately how many hours are devoted to medical ethics, over a 4-year period, at your school? (3) Who teaches the courses? (4) Briefly describe the content of your medical ethics program, if one exists.

Out of 124 institutions, 88 (71%) responded. Of these, 69 schools (56%) had a structured bioethics program, 10 (8%) had an integrated ethics curriculum, and seven (6%) had no program in place. The number of hours devoted to teaching ethics varied immensely. The majority of schools (63 [51%] respondents) provided 40 hours or less of ethics education and only nine (7%) provided more than 60 hours. Two schools provided more than 120 hours.[9]

DuBois and Burkemper (in 2002) requested syllabi from 121 U.S. medical schools and asked the curriculum directors from each school to return a questionnaire describing the medical ethics education at their institution.[10] In all, 87 schools (72%) responded. The investigators found that there is no uniformity among the schools and their requirements. As in Silverberg's study, 80% of the institutions (69 schools) required a formal ethics course. The amount of formal class time devoted to ethics education varied from no formal classroom hours to 200 hours over the course of the typical 4-year medical school program.[4,10] Half of the schools (44) taught ethics in only one year of the 4-year medical school program.

Lehmann et al. (in 2004) sent questionnaires to 125 U.S. medical schools and 16 Canadian medical schools.[11] Questionnaires were mailed to deans and course directors of medical ethics programs. The response rate was 87% (123 schools) for the deans and 64% (91 schools) for the course directors. Seventy-one (78%) of the schools had medical ethics integrated as part of a larger course, such as Introduction to Clinical Medicine. This is an increase from what the prior studies found, where only 60% of the schools taught ethics as part of a larger course.[9,10] The authors found that common barriers to medical ethics instruction were: lack of time in the curriculum, lack of qualified teachers, and lack of time in faculty schedules.[11] The findings were similar to those the two previous studies in that there was no uniformity across medical schools with respect to how medical ethics was taught.

Stern conducted a comparison of curricula *recommended* within the University of Michigan Medical School and those *actively taught* within the school.[12] To determine what the recommended curriculum components were, he examined both global and local recommendations. Stern defined the global recommended curriculum as that "which is recommended by individual scholars, professional associations, and reform commissions." The values in the global recommended curriculum were honesty, accountability, compassion, service, industry, interprofessional respect, public health, and self-policing. He further examined the recommended curriculum at the University of Michigan Medical School by examining the goal statement of the medical school, a

brochure for the department of medicine at the University of Michigan, student and resident handbooks, teaching guidelines for internal medicine instructors, and interviews with instructors of internal medicine. Finally, he investigated what was actually being taught by observing six internal medicine teams consisting of the attending physician, a senior resident, interns, and medical students for 6 months and audiotaped almost 200 hours of team discussions that contained a "values excerpt," which Stern defined as "a fragment of conversation (more than a single word) in which an individual expresses ideals, customs, norms, or institutional characteristics of internal medicine, medicine in general, or the hospital environment." He found that the most frequently discussed topics were interprofessional relations (26% of discussions), service (16%), accountability (14%), industry (12%), compassion (11%), and honesty (7%). Both public health (2%) and self-policing (2%) were minimally present in the audiotaped discussions. These topics are all relevant to medical ethics. Stern concluded that the presence of accountability and compassion in both the recommended and the taught curricula was encouraging.[12]

The above descriptive studies suggest that ethics education is now nearly ubiquitous, but that a substantial proportion of medical schools integrate their medical ethics education into other courses (such as introductory courses in clinical medicine). It is not possible to draw conclusions from these descriptive studies about the specific content, quality, or outcomes across various programs.

Goal of medical ethics education

The literature reveals a lack of consensus about the primary goal of medical ethics education. The literature suggests that two points of view exist. First, that teaching ethics is a means of creating virtuous physicians and, second, that teaching ethics is a means of providing physicians with a skill set for analyzing and resolving ethical dilemmas. This dichotomy, which we will refer to as the virtue/skill dichotomy, is embedded within the literature.[1,13–18]

Creating virtuous physicians. We identified three articles arguing that the

goal of medical ethics education is to create virtuous physicians. Freeman and Wilson argue that virtue includes "the basic core traits of character such as honesty, integrity and dedication,"[19] and that medical ethics education should foster virtuous physicians who would possess such traits.

Pellegrino and Thomasma recognize the merits of both sides of the virtue/skill dichotomy, though they ultimately claim that the goal of medical ethics education is to create virtuous physicians.[20] They argue that medicine is inherently a moral profession and that virtue can be taught "by practice, by example, and even by the study of ethics."[20] The authors claim that teaching ethics as a discipline and teaching ethics as virtue may ultimately lead to the fostering of virtuous physicians. The goal of teaching ethics as a discipline is to provide medical students with a skill set to approach ethical dilemmas. This skill set is useful because, if taught well, it can inspire "self-criticism and examination of one's own values"[20] and thus may indirectly serve to affect a student's character.

Like Pellegrino and Thomasma, Shelton argues that the most significant goal of teaching ethics should be to create virtuous physicians.[20,21] A "good doctor," he argues, possesses virtues such as "respect, compassion, and honesty, characteristics fundamental to any morality and that all professional medical caregivers are expected to embrace."[21]

Two authors comment upon the cynicism which seems to develop in medical students as they progress through medical school, and claim that teaching ethics as virtue may combat this tendency. Several empirical studies, which will be discussed below at more length, suggest that medical students may experience a decline in moral reasoning over the course of their undergraduate education. Feudtner et al. have identified this "ethical erosion" experienced by medical students.[22] In response to the growing concern that medicine is experiencing an ethical shift for the worse, Goldie suggests that "the task facing educators is not limited to producing students who can discern and understand the multiple factors involved in sound clinical decision making, but to help produce doctors who not only behave ethically, but are 'ethical

doctors.'"[23] According to Goldie, by creating ethical doctors, educators could help to prevent the development of cynicism in medical students.

Clearly, creating virtuous physicians is an admirable goal for medical ethics education. However, it is our belief that a more practical and measurable goal is to endow students with a set of skills for ethical reasoning that will allow them to recognize ethical dilemmas and equip them to reach practical, ethical solutions to those dilemmas. The literature, as it currently stands, does not answer how best to define or to measure this set of ethical skills, although the majority of the empirical work deals with the topic of moral reasoning. This area is also confused by terms such as "ethical erosion" and "cynicism." Such terms are commonly used but not clearly defined, and would benefit from work aimed at more rigorous definitions. Ethical erosion and cynicism may, in fact, be two different phenomena.

Teaching skills. We identified 10 authors who propose that, in general, the goal of ethics education should be to provide a set of skills for ethical analysis and decision making. Miles et al.[1] argue that "the final goal of medical ethics education is to endow physicians with 'practical wisdom,' an informed ability to realize values in clinical management." These authors claim that it is unrealistic to expect ethics education to create moral physicians and, instead, instruction should be focused on providing physicians with a sufficient set of skills to handle ethical dilemmas.[1] Miles et al. offer a set of teaching objectives for such a skill set that we find to be a reasonable summary of the overall goals of a medical ethics curriculum for undergraduates:

- To enable physicians to examine and affirm their own personal and professional moral commitments.
- To teach physicians to recognize the humanistic and ethical aspects of medical careers.
- To equip physicians with a foundation of philosophical, social, and legal knowledge.
- To enable physicians to employ this knowledge in clinical reasoning.
- To equip physicians with the interactional skills needed to apply this insight, knowledge, and reasoning to human clinical care.

Other authors echo this general approach.[24–29] Gross et al.[30] also believe that the goals of an ethics curriculum in a medical school should be to equip physicians with a knowledge base and a skill set to make ethical decisions in the course of patient care.

Glick's[15] proposal differs from the previous eight in that an ethics curriculum should seek to do more than just "provide the intellectual tools and interactional skills to deal with ethical problems." He argues that ethics education should be taken a step further and that the primary goal should be "to heighten the students' ethical sensitivity, to enhance their ethical performance, and at the very least, to prevent the erosion that almost invariably occurs in those qualities during the medical school years, if insufficient attention is paid to this area of endeavor."[15] Nevertheless, Glick argues that the moral character of medical students is formed upon arrival at medical school.

Empirical research on the outcomes of medical ethics education

Description of the studies. Studies that attempt to assess the outcomes of medical ethics education present varying and conflicting results. Because of the variability of populations studied and methodologies employed, the studies we identified in the literature make it difficult to draw broad conclusions. Some of these empirical studies suggest that endpoints such as moral reasoning ability are either not affected or negatively affected by medical ethics education, and others suggest they are affected positively.

Two studies suggest that the development of moral reasoning skills in medical students might be inhibited by medical education.[31,32] These studies tested medical students at the beginning of medical school and again either in the third year or the fourth year. The first study was conducted by Self et al. and involved a longitudinal study at Texas A&M University College of Medicine in 1993.[31] Twenty medical students were asked to take a moral reasoning exam, the Moral Judgment Interview (MJI), which was developed by Kohlberg.[33,34] The MJI involves a 45-minute structured interview and three scenarios involving hypothetical moral dilemmas and assessments of the participant's reasoning about them and resolution of them.

Based on the interview, scores are calculated that allow participants to be placed into six stages of moral development. Kohlberg groups these stages into three levels: preconventional (level of reasoning that elementary school children possess), conventional (approval of others, abiding by laws), and postconventional (highest moral development, very unusual). It was administered to the students at the beginning of medical school and again at the end of medical school. Self and his colleagues hypothesized that the "medical education experience inhibits the normally expected increase in moral reasoning of medical students."[31] Data from the study support this hypothesis, as there was no significant increase in moral reasoning as measured by the MJI at the end of the fourth year of medical school. Although provocative, the authors acknowledge that the study had certain limitations: the sample for the study was small and it did not control for the many other variables that may contribute to a lack of growth in moral reasoning during medical school. The certainty of its conclusions remains uncertain.[31]

To our knowledge, the findings of this study have only been replicated at one other institution, the medical school at the University of Sherbrooke in Quebec, Canada. In 2003, Paternaude et al. asked 54 medical students to complete Kohlberg's MJI at the beginning of medical school and again at the end of the third year of medical school.[32] Students in this study were found to have a significant decrease in moral reasoning by the end of the third year of medical school as measured by the MJI.[33,34] The authors hypothesize that this decrease in moral reasoning results from socialization that occurs throughout medical school, suggesting that medical ethics education may not protect against such effects. The authors conclude that further longitudinal studies are needed to understand "peer influence, institutional influence and the influence of the system of medical education on the development of students' moral reasoning."[32] Such studies highlight an important challenge for medical ethics education, namely to "develop a curriculum that will enable medical students at least to maintain their stage of moral development if not increase it through the medical school experience."[32]

Although certainly provocative, these two studies, in the end, do not permit conclusions either about whether moral reasoning is the most valid outcome to measure in medical students who study medical ethics or whether the Kohlberg MJI is the best instrument for measuring moral reasoning as applicable to medical practice. It is notable that the MJI does not specifically address medical ethics, but rather presents more generic moral dilemmas. This raises serious questions about the validity of the instrument's use in the assessment of moral reasoning in the context of medical ethics and about whether the outcomes of the Self and Patenaude studies would have been different if moral reasoning specifically in the context of medical dilemmas had been used in the assessments.

Two studies from the University of Toronto have attempted to evaluate the concept of "ethical sensitivity."[35,36] Hébert et al.[35] developed an instrument for evaluating the "ethical sensitivity" of medical students at the University of Toronto. This study tool has since been called the Problem Identification Test (PIT) and, in contrast to the approaches used in the studies just discussed, presents medical vignettes as the basis for the assessment performed. Ethical sensitivity as measured in this study was defined as "the ability to recognize that a moral issue exists."[36] The instrument used for assessing ethical sensitivity contained four vignettes in which the students were given a half-page to reply to each scenario. Students were given points based on whether they recognized three key issues within each case: autonomy, beneficence, and justice. In all, 498 students completed the exercise. First-, second-, third-, and fourth-year students participated. The first-year students were tested before receiving any medical education. Ethical sensitivity (measured by points received for recognizing the three key issues) increased from first-year students to second-year students, decreased from second-year students to third-year students, and decreased from third-year to fourth-year students.

The authors conclude that clinical vignettes may measure various ethical domains in different ways, but that they are a useful way to measure aspects of ethical sensitivity in medical students. The reasons for the decline found by the

authors are not directly addressed in their study, and it remains unknown whether medical ethics education contributes to decline in ethical sensitivity or whether such education simply is inadequate to prevent an ethical "erosion" that occurs as a consequence, possibly of medical socialization, during the clinical years of medical education. This is certainly a hypothesis worthy of further study, but would necessitate significant clarification of the concepts of ethical sensitivity and of "ethical erosion." Finally—and this is operationally a vital issue in the area of outcomes research—it remains unclear whether "ethical sensitivity," which in Hébert's study[35] is defined as the ability to recognize ethical dilemmas, can predict how a physician will handle a clinical ethical problem, which is arguably the outcome of most interest to medical educators.

In contrast with these studies, others suggest that ethics education may contribute to an increase in moral reasoning. Self et al.[38] conducted another study at Texas A&M's medical school and veterinary school using a standardized moral reasoning test. The test administered was Gibbs' Sociomoral Reflection Measure (SRM).[39] The SRM is a written version of Kohlberg's MJI. Two first-year medical school classes and one veterinary school class participated. The veterinary class served as the control group, as they had no required ethics education. The two classes of medical students received ethics education in the form of a two-quarter, two-credit course. One class of medical students received ethics education only in lecture format. The other class received lectures and participated in small-group discussion. All participants were tested before the course and upon completion of the second quarter. Prior to completing the two-quarter classes, there was no significant difference in the moral reasoning skills among the three groups. Tests performed following the completion of classes demonstrated a statistically significant increase ($p \leq$ .0001) in moral reasoning, as measured by the SRM, within the two experimental groups when compared with the control group. The authors concluded that a medical ethics course may significantly increase moral reasoning skills. Because the medical school class that had the small-group discussion had more significant increases in scores than did

the group limited to lectures, the authors concluded that the small-group discussions were a more effective method for developing moral reasoning than the lecture courses were. The discussion group had an increase that was 10 points higher than the lecture group ($p \leq$ .03).

A 1992 study of 110 first-year medical students at the University of Virginia School of Medicine found that ethics education had a positive, but limited, effect on how students responded to ethical dilemmas. Shorr et al.[40] avoided use of standardized survey instruments, claiming that these instruments measure potential behavior only, rather than factual knowledge. Instead, they used clinical vignettes as well as multiple-choice, true–false, and Likert-scale questions. First-year medical students taking a required ethics course took this test at the beginning and the end of the ethics course. Students answered a few more questions correctly after the course, but the change in scores was not statistically significant. The authors assert that two factors affected the validity of the results: approximately one-third of the students had already taken a medical ethics course prior to the course for this study, and most medical students "arrive at medical school with well-established ethical perspectives."[40] Despite these limitations, the authors concluded that ethics education is limited in its ability to increase moral reasoning skills of medical students, and that this is "probably because students arrive at medical school with well-established ethical perspectives."[40]

In another study of the outcomes of medical ethics education involving four classes of medical students from 1991 to 1994 at Texas A&M University College of Medicine, students took Rest's DIT test, which is another written version of Kohlberg's MJI, at the beginning of medical school, at the conclusion of their first-semester ethics course, and at the end of medical school.[41,42] On average, the students showed an increase in moral reasoning skills from the beginning of medical school to the end of their ethics course. The increase from the first test to the second test was six points, which was statistically significant ($p <$ .001). There was an 8.8-point increase in moral reasoning skills from the beginning of medical school to the end of medical school, which also was statistically

significant ($p <$ .001). The authors attributed this increase to the effect of small-group discussions.

Because of the different instruments used, it is difficult to resolve the variance in outcomes between the studies that found positive changes in moral reasoning and the two studies summarized earlier that demonstrated negative changes in moral reasoning. Deeper understanding of the meaning and validity of the instruments used in these studies as well as larger, confirmatory studies appear to be warranted if we are to understand whether medical ethics education increases ethical reasoning skills or, at least, delays or attenuates the negative ethical effects of medical socialization.

Problems with empirical outcomes research. Overall, there are strikingly few studies addressing the outcomes of medical ethics education. Other than recommending more careful study of the outcomes, we recognize two significant problems with studies found in the literature. The first is that the small number of empirical studies attempt to measure outcomes in a field in which broad educational goals are poorly defined. Although measures of ethical sensitivity and moral reasoning have been used as endpoints in the few outcomes studies available, what those instruments actually measure and how the factors they measure map onto the overall goals of ethics curricula remain uncertain. We believe that outcomes such as moral reasoning cannot be broadly validated in the absence of greater consensus surrounding the broader goals of ethics education. Furthermore, the instruments used to date have mostly (with the exception of Hébert's studies)[35,36] been developed for assessing moral reasoning and development in populations other than medical professionals in training. Because of this, we can only speculate about whether such instruments may be used in a valid way in medical students and, if they can be, whether they are measuring a skill that will positively affect their future medical practice.

The literature is further confused by the use of terms such as "ethical erosion." Does this mean the same as "decline in moral reasoning" or "decline in ethical sensitivity" or something else? If not, then one additional goal of medical ethics

education may be to prevent ethical erosion, which will necessitate work aimed at refining measures of ethical erosion. Narrowing and carefully defining the goals of ethics education and further developmental work on the instruments needed to measure the competency or competencies associated with these various goals would be important lines of inquiry. Given the interest in the idea of competency as a means of assessing the effects of medical education and training in general, working to define a set of "ethics competencies" in a broad enough way to permit reasonable consensus across U.S. medical schools would be a valuable aid to medical ethics educators. Defining such a competency could provide guidance to those involved in curriculum development, without stifling creativity, as well as provide a set of outcomes to be measured. Validated instruments or qualitative means of assessing the skills to be learned to achieve such a competency would also need to be developed.

Teaching methods in medical ethics education

The literature has addressed three questions about methods of teaching medical ethics to medical students: Who should teach medical ethics? What teaching methods are effective and should be used? How should students be evaluated within ethics curricula?

Who should teach medical ethics? We identified several articles that were in agreement that a multidisciplinary team of ethicist–philosophers and physicians should teach medical ethics.[8,26,43–45] Siegler argues that this interdisciplinary approach to medical ethics should allow for the ethicist–philosophers to "assume primary responsibility for teaching medical ethics" during the preclinical years, and for physicians to assume primary responsibility during clinical years.[43] Calman and Downie[8] contend that instructors for ethics courses need a background in medicine, philosophy, and teaching methods to successfully instruct medical students on ethics. We identified no empirical studies evaluating the outcomes of teaching by different disciplines. Assessing the differential impact of ethics teaching by members of various disciplines would be a fruitful line of inquiry.

Medical school faculty often believe they are incapable of teaching courses in medical ethics because they have no formal training in ethics instruction. Smith et al.[46] assert that "one of the major barriers to teaching clinical ethics is the faculty's perception that they lack expertise." The authors suggest that faculty development programs should be established to provide instructors with formal training in ethics to better prepare them to teach ethics courses.

What teaching methods should be employed? There is some consensus in the literature that ethics education should be integrated throughout the 4 years of medical school. According to Miles et al.,[1] ethics education should be "conceptually coherent, vertically and horizontally integrated through preclinical and clinical training, multidisciplinary, and demonstrate humane and value-conscious medical practice." Other authors also suggest that ethics education should be integrated vertically and longitudinally, and that it should be learner-centered and problem-based, rather than theory-based.[7,24,47] Martinez[48] argues, "Regardless of the specifics, every student in every medical school should be exposed to the same core set of ethical principles." There seems to be consensus that ethical development should be viewed as a process throughout the 4 years of medical school.[19]

In 1999, the John Conley Foundation for Ethics and Philosophy in Medicine sponsored an essay contest in which medical students were asked to submit answers to the question, "How can medical students best develop ethical thinking and behavior?"[49] One hundred medical students responded. Many students did not want lectures to be the primary teaching method for ethics. The majority of students wanted small-group discussions in which they could freely discuss the ethical issues that arise in practice. They did not want to discuss ethics as a black-and-white discipline. In addition, the students wanted ethics training in all 4 years of medical school with a focus on theory in the first year and applied clinical ethics in the following years. These all appear to us to be reasonable proposals.

Descriptive studies of teaching formats. Perkins et al.[50] attempted to illustrate the

difficulties they encountered after an ethics curriculum involving medical students and residents was first implemented at the University of New Mexico School of Medicine in 1983. The three methods that these authors have utilized at their institution to teach ethics are inpatient consultations, intensive courses, and case conferences. They discussed the strengths and weaknesses of each method and proposed solutions for future implementations of these methods. Inpatient consultations were initially used to teach medical ethics. The authors found that the lack of prior ethics instruction led to misconceptions and misunderstandings during the ethics consultations. In addition, because of time constraints, not all residents took advantage of the ethics consultations or simply accepted the opinions of the ethicist without any individual reasoning. Intensive courses were used to provide medical students and residents with foundational ethics instruction in a 4-week elective entitled Ethics for the Clinician. The authors suggested that problems associated with this method were the short span of the course, students' prior misconceptions, and inconsistent attendance. Clinical conferences were held in an attempt to overcome the difficulties of consultations and the elective courses. The authors claim that teaching ethics in a conference setting is an efficient way of teaching and seems to favorably affect patient care. However, there were drawbacks to conferences as well. Once again, the lack of formal training in ethics and ethics reasoning made it difficult to do little more than cover foundational ethics concepts during the conferences because both students and residents lacked such training.

Tysinger et al.[51] found two disadvantages to the problem-based learning (PBL) approach implemented at the University of Texas Southwestern Medical School in which students completed group assignments. The first problem encountered was that it was difficult to assess students' individual progress and their development of moral-reasoning skills. Second, the students were exposed to only six cases throughout the course. Nevertheless, the authors concluded that PBL is effective in ethics education.

Empirical studies of teaching formats. Smith et al.[46] conducted a research study

at the University of Washington School of Medicine comparing the effectiveness of two methods of ethics instruction within their medical school. In all, 146 third-year medical students in 1999-2000 participated. The students were given three case scenarios containing instructions for ethical analysis and then broken into two groups. Both groups wrote case analyses and were given written feedback; group 2 also participated in a discussion group. All students submitted a final case analysis. Four components of the case analyses were evaluated: abilities to identify ethical issues, see multiple viewpoints, formulate an action plan, and justify one's actions. The students who were in the discussion group had more improvement in their scores than did those in the case analysis group. The discussion group participants also had higher scores overall than the other group did. The findings in this study suggest that group discussion is a useful way to improve case analysis in medical students. In rating the two groups, only one quarter of the students in the case analyses group had positive comments about the exercise, whereas over three quarters of those in the discussion group had positive feedback.[46]

Self et al.[52] conducted a study to determine the amount of small-group discussion that is needed to increase the moral reasoning of medical students. The investigators recruited first-year medical students at Texas A&M University College of Medicine from 1991–1998. A total of 729 students participated. The method used to measure the moral reasoning of the participants was Rest's DIT.[27] The test was administered to students at three intervals: upon arrival at medical school, following their first semester in which they took a medical ethics course, and at the end of medical school. To analyze the results, students were divided into two groups: those who had participated in less than 20 hours of small-group discussions (581 students) and those who had participated in more than 20 hours of such discussions (148 students). Although there was no increase in DIT scores in the groups exposed to fewer than 20 hours of group discussion, there was a statistically significant increase in moral reasoning as measured by the DIT in the students who had participated in more than 20 hours.

Self et al.[53] also found that discussion films with medical students were successful in increasing their moral reasoning skills. In this study, each week, two groups of students viewed a film that was followed by a 1-hour discussion of the issues in the film. The third group of students, the control group, did not participate in this course. The Rest DIT was administered to the three groups of students at the beginning of their first year of medical school: an experimental group that took a one-quarter elective ethics course involving film discussion (tested again at the end of the quarter), an experimental group that took a two-quarter elective ethics course involving film discussion (tested again at the end of the two quarters), and a control group that did not take the film discussion course. Students in both the one-quarter group and the two-quarter group showed a statistically significant increase in their DIT scores ($p \leq .002$ and $p \leq .007$, respectively).

Ales et al. concluded in their Cornell University Medical College study that any one of three formats for an ethics course would help the course to achieve its goals: small-group discussions, a case-based rather than a theory-based approach, or weekly sessions dealing with issues of a particular specialty.[29]

Roff and Preece offered a 2-week intensive at Dundee University Medical School in the United Kingdom to second- and third-year medical students.[54] Students were asked to research ethical dilemmas. At the end of the course, the students presented their dilemmas to their fellow students and completed a 3,000-word essay, which included an in-depth discussion of the issues. The authors found this approach was relatively easy to implement. The students were not formally assessed in this course, so its effectiveness on students' moral reasoning skills is not known. The student evaluations and feedback from presenters held the course in high regard.

We found that the following conclusions about teaching medical ethics to medical students are supported by one or more of the empirical studies as noted above:

- Medical ethics education should be integrated throughout the entire medical school curricula and should be viewed as a process.

- Students who participate in group discussions are more satisfied with medical ethics education than those who participate only in written exercises.[46]
- An elective ethics course, even if it only lasts one quarter, may effectively increase a student's moral reasoning skills in first-year medical students.[52]
- Greater than 20 hours of ethics education seems to be more effective than less than 20 hours.[52]

Evaluation methods in medical ethics education

Many methods have been used to evaluate medical students' performance in moral reasoning. Numerous studies have utilized Kohlberg's MJI,[33] Rest's DIT,[27] and Gibbs' Sociomoral Reflection Measure (SRM).[39,55] Goldie et al.[47] used a survey instrument developed by Kipnis and Gerhard at the University of Hawaii at Mānoa John A. Burns School of Medicine for one of their studies at Glasgow University Medical School. In addition to such objective testing methods, small-group discussion can be evaluated based on participation. Finally, two articles suggest adding ethics questions to already existing professional exams as a way of testing students' moral and ethical reasoning.[8,56]

Savulescu et al.[57] argued for standardized evaluation of medical students in ethics. First, a standardized method of evaluation would permit methods of teaching to be evaluated and improved. Second, evidence that an ethics program is useful would provide data in support of resources and time committed to ethics education. Third, schools could establish a more uniform core curriculum of medical ethics, so that the ethics curriculum would not vary so widely from school to school.[10] Finally, analysis of means to evaluate medical ethics curricula and student performance would lead to a clearer definition of the goals of medical ethics education.

Calman and Downie[8] concluded that the lack of assessment in ethics curricula may contribute to students' not taking ethics courses seriously. To encourage students to take ethics education seriously, Culver et al.[26] argue that "the content of the medical ethics curriculum should be rigorous and precise. The material should be taught unapologetically and at a challenging level of difficulty. Readings

should be required, and students' learning should be measured by means of reasonably difficult examinations or required papers or both." Sanders[56] proposes that evaluation is "integral to preclinical ethics teaching."

Martinez[48] contends that "the role of ethics in medical education would be significantly enhanced if the National Board of Medical Examiners and specialty accreditation boards would require candidates to pass a separate section on ethics before they could become board certified or even allowed to practice."

Discussion

U.S. medical schools now universally include medical ethics education as part of their curricula. Despite this, our review reveals that deep shortcomings exist in the literature on medical ethics education. Deficits exist in all areas of the literature: in the theoretical work done on the overall goals of medical ethics education; in the empirical studies that attempt to examine outcomes for students; and in the studies evaluating the effectiveness of various teaching methods. Below we identify the problems in each of these three areas and conclude that there are substantial opportunities for contribution to the literature on medical ethics education in all of them.

Research on theoretical issues

There remain disagreements about whether medical ethics curricula should aim to imbue medical students with a set of skills for recognizing and solving ethical problems or to improve the moral character of medical students (the virtue/skill dichotomy). Given the difficulties in measuring virtue among physicians and medical students, educators have tended to favor curricula that teach ethical skills over virtue-based curricula. Although we support the goal of developing ethical doctors, our view is that medical ethics education should teach both the skills of ethical analysis and the ethical content which all practicing physicians must know to practice ethically. We believe that the time has come to agree that teaching a skill set in the medical ethics curriculum, much as we teach other skill sets (e.g., differential diagnosis, physical examination), should be the ultimate goal of medical ethics education. These skills are as vital to the practice of medicine as

the other skills routinely taught in medical school and deserve equal attention. Future outcomes research should thus focus on developing useful measures of moral development and ethical skills. Based on the empirical work cited above among medical students, we are hopeful that such a strategy will lead to improvements in the ethical behavior of physicians, leaving aside the operationally more difficult issues of whether education can improve the virtue of physicians. The field would benefit from further theoretical work aimed at better delineating the core content, core processes, and core skills relevant to the ethical practice of medicine. This work could serve as a framework for addressing outcomes in the future (see below).

We believe that medical educators should consider whether the ethics skills taught in the undergraduate curriculum should be distilled into a competency, in much the same way that other competencies for residents and others have been developed. Having such a statement on a national level would serve several important ends, including helping to focus medical ethics curricula as well as providing more clearly defined outcomes for empirical study. Although we do not advocate mandates because they are likely to stifle creative curriculum development, we do believe that consensus around the broad elements of a competency in medical ethics is possible, just as it has been in other areas such as professionalism.[58]

Surveys of practicing physicians suggest that physicians believe that ethics courses are advantageous in clinical ethical dilemmas.[59] However, there remain significant gaps in our understanding of the ways in which ethics curricula may contribute to improvements in doctors' ability to handle ethical problems, how well doctors recognize and can articulate ethical issues, and whether ethics education contributes positively to ethical patient care by physicians once they are in practice. This is an area ripe for further investigation and inquiry, perhaps using qualitative methods designed to explore the effects of ethics curricula.

Empirical studies

The literature would benefit from much deeper reflection on the individual skills that physicians in training must learn to

practice more ethically. There is a lack of systematic analysis of the measurable elements of ethical skills and the best means for assessing them. Thus, we recommend further analysis and reflection on these fundamental concepts: moral reasoning, ethical sensitivity, moral judgment, ethical erosion, medical cynicism, and others. Lack of clarity about these terms makes the current literature difficult to interpret, apply, and draw conclusions from, and raises many important questions: What is moral reasoning and how does it differ from ethical analysis? Is ethical sensitivity a precursor skill to ethical analysis? Is moral reasoning an important skill in ethics competency? How is it different from ethical sensitivity? Is ethical erosion the same as cynicism, or is it merely a decline in ethical sensitivity? The studies we have reviewed demonstrate that medical ethics curricula may contribute to students' increase in moral reasoning skills and ethical sensitivity; however, there is a lack of clarity regarding the meaning of each of these concepts and a lack of rigor regarding the validity and reliability of the instruments used to measure them. In short, we may know that moral reasoning skills may improve, but we still do not have solid reasons for *why* they improve (or conversely, decline). We also recommend that outcomes measures should be specifically tailored to medical students. Instrument development should thus focus on this group during development, validation, and reliability testing, and the content of instruments used to evaluate educational outcomes in medical ethics education should reflect relevant clinical medical examples.

We recognize the obvious hurdles facing efforts to assess the quality and outcomes of medical ethics education. Medical ethics courses are heavily weighted toward teaching process over content— that is, procedures for decision making, rather than deeper understanding of the problems themselves. This differs from the emphasis given to most other courses taught within the traditional medical school curriculum, where the teaching of content occupies most of the effort. Moreover, one might argue that the range of acceptable approaches to ethical analysis is broader than in other traditional areas of the curriculum. For example, differential diagnosis is a critical skill in medical education, one in which

students must demonstrate competency in order to satisfy the requirements of medical practice. Although more difficult to assess than, say, whether a student can assess deficits in the peripheral sensory neurological exam (another skill), excellent skill in differential diagnosis would still not be as complex or "open" as assessing whether a student can competently analyze the ethics of a personal medical dilemma. These considerations make the outcomes of medical ethics curricula much more theoretically and empirically difficult to characterize and measure than other areas. Although there are clearly required facts that must be taught within ethics courses (What is a valid advance directive? What is the accepted legal definition of brain death? What are the criteria for assessing decisional capacity?), we believe that the main thrust of ethics curricula should be to improve students' ability to recognize ethical issues that arise in patient care and practice and reason through them to arrive at acceptable possible outcomes.

Research on outcomes

Most of the empirical studies we reviewed have sought to measure objective outcomes, such as increases in a moral reasoning score. Because several scales aimed at measuring moral reasoning exist and have been employed variously in different studies, it is difficult to analyze these studies to assess their reliability (Are the methods used measuring what they are intended to measure?), or to draw comparisons between studies and to draw conclusions about the effectiveness of different teachers and teaching methods. Studies specifically designed to improve understanding of the validity and reliability of the existing measures would benefit the field. This might also further any efforts to bring greater standardization to medical ethics curricula across the country, since the most useful measures could be used to compare outcomes of medical ethics education across institutions, and would enhance any efforts to study the superiority of various teaching methods over others. Also, descriptive work on teaching methods and outcomes would be helpful as educators design and refine curricula, including descriptions of methods, formats, resources, and materials others have found helpful. Few descriptive studies are found in the literature.

Because medical ethics education focuses heavily on process, we believe study of the development and improvement of moral reasoning among medical students is an area that is ripe for qualitative investigations. Such a qualitative understanding of the outcomes of medical ethics education, as obtained through comments, interviews, focus groups, and narrative, would be valuable in characterizing how those outcomes are achieved— or not—in medical ethics courses for medical students. Qualitative work would benefit each of the areas of shortcoming we have identified by helping answer questions such as: What are the goals of medical ethics education? What are the best methods for teaching ethics education to students? How do medical students identify and perceive ethical problems? How does the process change over the four years of medical school? How do the moral reasoning skills of students and experienced ethicists differ? How do different teaching methods, teachers, and formats contribute to the overall educational experience? What are the best ways to evaluate the outcomes of medical ethics courses?

We are used to asking whether we are teaching other areas of the medical curriculum effectively. The time has now come to organize an effort to improve and validate this important area of medical education. In the end, effective medical ethics education will further the goals of medicine in dramatic and tangible ways.

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References

1 Miles SH, Lane LW, Bickel J, Walker RM, Cassel CK. Medical ethics education: coming of age. Acad Med. 1989;64:705–14.

2 Hattab AS. Current trends in teaching ethics of healthcare practices. Developing World Bioeth. 2004;4:160–72.

3 Pellegrino ED. The metamorphosis of medical ethics: a 30-year retrospective. JAMA. 1993;269:1158–62.

4 Parker MH, Price DA, Harris PG. Teaching of medical ethics: implications for an integrated curriculum. Med Educ. 1997;31:181–87.

5 Musick D. Teaching medical ethics: a review of the literature from North American medical schools with emphasis on education. Med Health Care Philos. 1999;2:239–54.

6 Association of American Medical Colleges. Curriculum Directory 1998–1999. 27th ed. Washington, DC: Association of American Medical Colleges, 1998.

7 Fox E, Arnold RM, Brody B. Medical ethics education: past, present, and future. Acad Med. 1995;70:761–69.

8 Calman KC, Downie RS. Practical problems in the teaching of ethics to medical students. J Med Ethics. 1987;13:153–56.

9 Silverberg LI. Survey of medical ethics in US medical schools: a descriptive study. J Am Osteopath Assoc. 2000;100:373–78.

10 DuBois JM, Burkemper J. Ethics education in U.S. medical schools: a study of syllabi. Acad Med. 2002;77:432–37.

11 Lehmann LS, Kasoff WS, Koch P, Federman DD. A survey of medical ethics education at U.S. and Canadian medical schools. Acad Med. 2004;79:682–89.

12 Stern DT. Practicing what we preach? An analysis of the curriculum of values in medical education. Am J Med. 1998;104: 569–75.

13 Singer PA. Recent advances. Medical ethics. BMJ. 2000;321:282–85.

14 Putman DA. Virtue and the practice of modern medicine. J Med Philos. 1988;13: 433–43.

15 Glick SM. The teaching of medical ethics to medical students. J Med Ethics. 1994;20: 239–43.

16 Branch Jr., WT. Supporting the moral development of medical students. J Gen Intern Med. 2000;15:503–08.

17 Sulmasy DP. Should medical schools be schools for virtue? J Gen Intern Med. 2000;15: 514–16.

18 Shelton W. Can virtue be taught? Acad Med. 1999;74:671–74.

19 Freeman JW, Wilson AL. Virtue and longitudinal ethics education in medical school. S D J Med. 1994;47:427–30.

20 Pellegrino ED, Thomasma DC. The Virtues in Medical Practice. New York: Oxford University Press, 1993.

21 Shelton W. Can virtue be taught? Acad Med. 1999;74:671–74.

22 Feudtner C, Christakis DA, Christakis NA. Do clinical clerks suffer ethical erosion?

Students' perceptions of their ethical environment and personal development. Acad Med. 1994;69:670–79.

23 Goldie JGS. The detrimental ethical shift towards cynicism: can medical educators help prevent it? Med Educ. 2004;38:232–38.

24 Goldie J, Schwartz L, Morrison J. A process evaluation of medical ethics education in the first year of a new medical curriculum. Med Educ. 2000;34:468–73.

25 Wong JGWS, Cheung EPT. Ethics assessment in medical students. Med Teach. 2003;25:5–8.

26 Culver CM, Clouser KD, Gert B, et al. Basic curricular goals in medical ethics. N Engl J Med. 1985;312:253–56.

27 Rest JR. Can ethics be taught in professional schools? The psychological research. In Ethics: Easier Said Than Done. Marina del Rey, CA: Josephson Institute for the Advancement of Ethics, 1988;22–26.

28 Hafferty FW, Franks R. The hidden curriculum, ethics teaching, and the structure of medical education. Acad Med. 1994;69:861–71.

29 Ales KL, Charlson ME, Williams-Russo P, Allegrante JP. Using faculty consensus to develop and implement a medical ethics course. Acad Med. 1992;67:406–8.

30 Gross ML. Ethics education and physician morality. Soc Sci Med. 1999;49:329–42.

31 Self DJ, Schrader DE, Baldwin Jr. DC., Wolinsky FD. The moral development of medical students: a pilot study of the possible influence of medical education. Med Educ. 1993;27:26–34.

32 Patenaude J, Niyonsenga T, Fafard D. Changes in students' moral development during medical school: a cohort study. Can Med Assoc J. 2003;168:840–44.

33 Kohlberg L. Essays on Moral Development: Vol. II. The Psychology of Moral Development. New York: Harper and Row, 1984.

34 Barger RN. A Summary of Lawrence Kohlberg's Stages of Moral Development. 2000. ⟨www.nd.edu/rbarger/kohlberg.html⟩. Accessed 4 September 2005.

35 Hébert PC, Meslin EM, Dunn EV, Byrne N, Reid SR. Evaluating ethical sensitivity in medical students: using vignettes as an instrument. J Med Ethics. 1990;16:141–45.

36 Hébert PC, Meslin EM, Dunn EV. Measuring the ethical sensitivity of medical students: a study at the University of Toronto. J Med Ethics. 1992;18:142–47.

37 Akabayashi A, Slingsby BT, Kai I, Nishimura T, Yamagishi A. The development of a brief and objective method for evaluating moral sensitivity and reasoning in medical students. BMC Med Ethics. 2004;5: E1.

38 Self DJ, Wolinsky FD, Baldwin Jr. DC. The effect of teaching medical ethics on medical students' moral reasoning. Acad Med. 1989; 64:755–59.

39 Gibbs JC, Widaman KF. Social Intelligence: Measuring the Development of Sociomoral Reflection. Englewood Cliffs, NJ: Prentice-Hall, 1982.

40 Shorr AF, Hayes RP, Finnerty JF. The effect of a class in medical ethics on first-year medical students. Acad Med. 1994; 69: 998–1000.

41 Self DJ, Olivarex M, Baldwin Jr., DC. Clarifying the relationship of medical education and moral development. Acad Med. 1998;73:517–20.

42 Rest JR. Development in Judging Moral Issues. Minneapolis, MN: University of Minnesota Press, 1979.

43 Siegler M. A legacy of Osler: teaching clinical ethics at the bedside. JAMA. 1978;239:951–56.

44 Singer PA, Pellegrino ED, Siegler M. Clinical ethics revisited. ⟨http://www.biomedcentral.com/1472-6939/2/1⟩. Accessed 4 September 2005.

45 Self DJ, Skeel JD, Jecker NS. A comparison of the moral reasoning of physicians and clinical medical ethicists. Acad Med. 1993;68:852–55.

46 Smith S, Fryer-Edwards K, Diekema DS, Braddock III CH. Finding effective strategies for teaching ethics: a comparison trial of two interventions. Acad Med. 2004;79:265–71.

47 Goldie J, Schwartz L, McConnachie A, Morrison J. Impact of a new course on students' potential behaviour on encountering ethical dilemmas. Med Educ. 2001;35:295–302.

48 Martinez SA. Reforming medical ethics education. J Law Med Ethics. 2002;30:452–54.

49 Charon R, Fox RC. Critiques and remedies: medical students call for change in ethics teaching. JAMA. 1995;274:767–71.

50 Perkins HS, Geppert CMA, Hazuda HP. Challenges in teaching ethics in medical schools. Am J Med Sci. 2000;319:273–78.

51 Tysinger JW, Klonis LK, Sadler JZ, Wagner JM. Teaching ethics using small-group, problem-based learning. J Med Ethics. 1997; 23:315–18.

52 Self DJ, Olivarez M, Baldwin Jr. DC. The amount of small-group case-study discussion needed to improve moral reasoning skills of medical students. Acad Med. 1998;73:521–23.

53 Self DJ, Baldwin Jr. DC, Olivarez M. Teaching medical ethics to first-year students by using film discussion to develop their moral reasoning. Acad Med. 1993;68:383–85.

54 Roff S, Preece P. Helping medical students to find their moral compasses: ethics teaching for second and third-year undergraduates. J Med Ethics. 2004;30:487–89.

55 Self DJ, Davenport E. Measurement of moral development in medicine. Camb Q Healthc Ethics. 1996;5:269–77.

56 Sanders M. The forgotten curriculum: an argument for medical ethics education. JAMA. 1995;274:768–69.

57 Savulescu J, Crisp R, Fulford KWM, Hope T. Evaluating ethics competence in medical education. J Med Ethics. 1999;25:367–74.

58 National Board of Medical Examiners. Embedding professionalism in medical education: assessment as a tool for implementation. ⟨http://www.nbme.org/PDF/NBME_AAMC_ProfessReport.pdf⟩. Accessed 4 September 2005.

59 Pellegrino ED, Hart RJ, Henderson SR, Loeb SE, Edwards G. Relevance and utility of courses in medical ethics: a survey of physicians' perceptions. JAMA. 1985;235:49–53.

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In 2001, researchers at the Indiana University School of Medicine found that thrombocytopenia purpura—a blood clotting disorder—is caused by a mutation in a certain gene that causes an enzyme required for proper blood flow to become inactive.

For other important milestones in medical knowledge and practice credited to academic medical centers, visit the "Discoveries and Innovations in Patient Care and Research Database" at ⟨www.aamc.org/innovations⟩.