Teaching Medical Students the Important Connection between Communication and Clinical Reasoning

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BACKGROUND: Medical students are rarely taught how to integrate communication and clinical reasoning. Not understanding the relation between these skills may lead students to undervalue the connection between psychosocial and biomedical aspects of patient care.

OBJECTIVE: To improve medical students' communication and clinical reasoning and their appreciation of how these skills interrelate in medical practice.

DESIGN: In 2003, we conducted a randomized trial of a curricular intervention at Johns Hopkins University School of Medicine. In a 6-week course, participants learned communication and clinical reasoning skills in an integrative fashion using small group exercises with role-play, reflection and feedback through a structured iterative reflective process.

PARTICIPANTS: Second-year medical students.

MEASUREMENTS: All students interviewed standardized patients who evaluated their communication skills in establishing rapport, data gathering and patient education/counseling on a 5-point scale (1 = poor; 5 = excellent). We assessed clinical reasoning through the number of correct problems listed and differential diagnoses generated and the Diagnostic Thinking Inventory. Students rated the importance of learning these skills in an integrated fashion.

RESULTS: Standardized patients rated curricular students more favorably in establishing rapport (4.1 vs 3.9; P=.05). Curricular participants listed more psychosocial history items on their problem lists (65% of curricular students listing $\geq$1 item vs 44% of controls; P=.008). Groups did not differ significantly in other communication or clinical reasoning measures. Ninety-five percent of participants rated the integration of these skills as important.

CONCLUSIONS: Intervention students performed better in certain communication and clinical reasoning skills. These students recognized the importance of biomedical and psychosocial issues in patient care. Educators may wish to teach the integration of these skills early in medical training.

KEY WORDS: communication skills; clinical reasoning; medical education (undergraduate); reflection, feedback.
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Understanding each patient's biological, psychosocial and cultural background is the foundation of effective patient care. To achieve this, a physician must use communication skills, biomedical knowledge and clinical judgment to generate and modify diagnostic hypotheses (i.e., clinical reasoning). The importance of communication and clinical reasoning is recognized by governing and accreditation bodies.[1–3] Successful use of these skills is linked to important outcomes including improved diagnostic and clinical proficiency,[4,5] decreased medical errors,[6] reduced emotional distress,[2] and increased patient and physician satisfaction.[7–9] Nevertheless, research shows many inadequacies in clinicians' skills including incomplete solicitation of patient concerns[10] and inconsistent exploration of psychosocial issues.[11] These practices can lead to inappropriate prioritization of problems, impaired clinical reasoning and poor therapeutic alliances with the potential for medical error and harm.

Preliminary studies suggest that communication skills training may improve students' ability to gather accurate, relevant information.[4] Both biomedical and psychosocial history inform clinical reasoning. Teaching communication and clinical reasoning in isolation may prevent students from understanding the important link between these skills and may lead them to undervalue the psychosocial aspects of patient care. Nevertheless, we found no published curricula designed to help students learn to integrate these skills.

We developed a curriculum entitled AIME (An Integrated Medical Encounter) to teach the connection between communication and clinical reasoning to second-year medical students. The objectives were for students to: (1) demonstrate strategies for patient-centered communication, (2) demonstrate strategies for clinical reasoning, (3) understand the link between communication and clinical reasoning, and (4) appreciate both biomedical and psychosocial issues in patient care. This paper describes the curriculum and results of a randomized trial to determine curricular effectiveness.

METHODS

Background

We used a 6-step approach to curriculum development.[12] Our needs assessment at Johns Hopkins University School of Medicine included a survey of clerkship students, preclinical faculty, and clerkship directors to assess in which settings communication and clinical reasoning are taught and the adequacy of clerkship student preparation. We found little formal instruction of these skills throughout the 4 years. The majority

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of students and faculty felt that clerkship students were not prepared in these skills, which is consistent with the results of a national survey of clerkship directors.[13]

We conducted a literature search to determine how these skills are taught. Among the 6 models of communication skills training,[14–19] the Three Function Model of the Medical Interview[14] (emphasizing establishing rapport, data gathering, and patient education and counseling) provides the best framework to discuss the connection between communication and clinical reasoning by allowing students to see how the patient-physician exchange influences the amount and type of medical information obtained. Clinical reasoning is often taught in a case-based approach emphasizing differential diagnosis generation.[20–22]

Curriculum

Teaching and Learning Strategies. Our intervention ran concurrently with the second-year Clinical Skills course, which teaches medical history-taking and physical examination. Students practice skills with hospitalized patients in the course but do not formally have dedicated training in communication or clinical reasoning. In AIME, we taught communication, clinical reasoning and the connection between them using self-reflection, group discussion, videotaped encounters, role-play, and feedback.

We developed a Communication Skills Observation Guide modeled after the Calgary Cambridge Observation Guide[23] with questions corresponding to the Three Function Model[14] of interviewing (Appendix 1). Students used the guide to observe for and comment on communication skills during role-plays. Role-play cases contained communication barriers (e.g., patient reluctance to discuss illicit drug use) to allow students to work through communication challenges.

Clinical reasoning instruction focused on developing a patient-specific problem list and differential diagnosis. Problem lists included signs and symptoms of disease, past medical history, family history, psychosocial history, and patient preferences for care. Differential diagnosis generation included potential diagnoses in each organ system and disease categories using the mnemonic VINDICATE (vascular, infectious, neoplastic, drug related, inflammatory, collagen vascular, allergic/autoimmune, traumatic, endocrine).

Curriculum Structure. The curriculum ran for 6 weeks with groups of six students and 1 or 2 faculty facilitators. Weekly 3-hour sessions introduced techniques in communication and clinical reasoning in a step-wise fashion (Appendix 2). Sessions began with a brief didactic and short video highlighting certain skills. The remaining time was devoted to role-play.

The role-play was a structured experience using time-outs. Students not interviewing or playing the patient role observed the encounter for communication skills using the observation guide. The time-out involved a 6-step iterative reflective process with feedback by self-reflection, peers and faculty (Appendix 3). The discussion addressed communication and clinical reasoning challenges faced by the interviewer, possible diagnoses, and how communication affected the quality of the medical information obtained. Students also created a problem list and discussed strategies for gathering additional information to test hypotheses. The role-play resumed with a different student interviewer.

Implementation

We targeted all 121 second-year students in the 2003 to 2004 academic year. To avoid potential contamination within Clinical Skills groups, 60 students were randomly assigned to AIME in a 3-step process. First, each student was randomly assigned to one of 30 Clinical Skills groups. Each group was then randomly assigned to participate or not participate in AIME. Finally, members of each intervention group were randomly separated into 10 different AIME groups so that no members of an AIME group were in the same Clinical Skills group. Control students received identical instruction later in the year. The Johns Hopkins Institutional Review Board approved the study protocol.

We recruited faculty who were not currently facilitating in other areas of the curriculum to avoid contamination with Clinical Skills instruction. To ensure uniform teaching, we held a 2-hour faculty development session 1 week before starting AIME that allowed faculty to participate in a simulated session using a standardized patient and student volunteers. We spent 15 minutes reviewing session goals and teaching methods each week with faculty.

Curriculum Evaluation Methods

Baseline Assessment of Knowledge and Skills. We introduced the curriculum to the entire class in a lecture 1 week prior to the intervention. At that time, students rated their proficiency in communication and clinical reasoning on a 5-point scale (0 = no exposure; 4 = can teach to others) and provided their age, gender, college major, previous interviewing experience, and prior health professional training.

Since students had not had prior exposure to medical interviewing or pathophysiology, we assessed baseline knowledge and skills by showing a videotaped medical encounter. Patient and physician roles were scripted to portray positive and negative communication behaviors. Students answered questions about communication behaviors displayed by the physician, created a problem list and generated diagnoses with supporting and refuting reasons. Students also completed the Diagnostic Thinking Inventory which is a self-reported questionnaire assessing clinical reasoning.[24] The inventory contains 41 questions rated on a 6-point scale, with higher scores indicating greater diagnostic ability (Cronbach $\alpha = 0.83$).

Assessment of Student Performance. All students underwent a two-station standardized patient (SP) interaction after the intervention to assess communication and clinical reasoning skills. Each SP had 8 hours of training per case by 2 of the authors (D.M.W., E.G.P.) and experienced trainers at our institution. The SPs were observed by the trainers, D.M.W., and E.G.P. prior to and during student interactions to ensure accuracy of their presentation and student ratings. The cases represented disease processes covered in the Pathophysiology course (hyperthyroidism and rheumatoid arthritis). Each SP had three psychosocial issues relating to the effect of their illness on their health, personal life and job performance. SPs were trained to respond only to direct questions regarding these issues.

Students spent fifteen minutes in each SP encounter. SPs completed a 30-item interpersonal checklist rating behaviors on a 5-point scale (1 = poor; 5 = excellent) for a total possible score ranging from 30 to 150 per case. We combined select

questions into three subscales, including five questions each on data gathering (Cronbach $\alpha=0.85$), establishing rapport ($\alpha=0.90$), and patient education and counseling ($\alpha=0.86$) (Appendix 4). Each subscale score ranged from 5 to 25 per case. Subscale questions were reviewed to assure face and content validity. Standardized patients also completed a history item checklist to determine what percent of the medical history was elicited.

For clinical reasoning, students generated a problem list and differential diagnosis giving supporting and refuting features for their top three choices. They also completed the Diagnostic Thinking Inventory. To check for clinical accuracy, 15 internal medicine physicians independently reviewed a written version of each case and all supported the leading diagnoses.

Curricular Assessment. Students and faculty assessed the effectiveness of achieving the curricular objectives (1=very effective; 4=very ineffective) and the importance of teaching the targeted skills together (1=strongly agree; 4=strongly disagree). We also asked for feedback regarding the most and least useful parts of the curriculum, perceived changes in behavior, and suggestions for change.

Statistical Analyses. All data were coded without personal identifiers and analyzed in a blinded fashion. We compared baseline characteristics using Student's *t*-tests for continuous variables and chi-square analyses for dichotomous variables. We assessed differences in self-rated proficiency in communication and clinical reasoning using the Wilcoxon rank-sum test. We used χ^2 analyses to compare students' baseline ability to document communication observations.

We assessed communication skills via SP ratings of the total 30-item interpersonal score and in data gathering, establishing rapport, patient education and counseling for each case. To make comparisons via Student's *t*-tests, we averaged scores for both cases. For each student, possible mean scores ranged from 30 to 150 for the total interpersonal rating and 5 to 25 for each subscale rating. We then converted each average score to a 5-point score (1=poor; 5=excellent) based upon the number of items contained in each category. We averaged the number of case appropriate problems listed, differential diagnoses generated, and supporting and refuting factors given for the two cases and compared differences using Student's *t*-tests or Wilcoxon rank-sum tests based on the data distribution. Diagnostic Thinking Inventory scores were compared using Student's *t*-tests. To assess the percent of students listing one or more psychosocial history items, we used chi-square analysis. We used multivariable analyses to determine the independent influence of baseline characteristics on each outcome measured.

We had 80% power to detect a 0.22 difference in each of the four communication scale ratings and a 1.2 difference in the total number of patient problems listed ($\alpha=0.05$). All analyses were performed using Stata Statistical Software: Release 8.0 (Stata Corporation, College Station, TX, 2002).

RESULTS

Baseline Student Characteristics, Knowledge, and Skills

All students remained in their assigned group and 120 completed the standardized patient exercise. At baseline, we found no differences in age, gender, college major or previous interviewing experience, but found a difference in previous health professional training (Table 1). AIME students were more likely to report familiarity with developing a differential diagnosis ($P=.01$), but did not differ in any other area of self-assessment.

Students performed similarly in recognizing specific communication skills and clinical reasoning ability (Table 1). Fifty-eight percent of students in each group listed the correct diagnosis.

Postintervention Performance

Each group obtained similar numbers of history items during SP interviews (mean of 64.2% vs 63.1%). AIME students scored statistically higher ratings in establishing rapport, but did not differ in other interpersonal scores (Table 2). Seventy-nine percent of AIME students and 69% of controls listed hyperthyroidism as the leading diagnosis ($P=.21$); ninety-two percent of participants and 95% of controls listed rheumatoid arthritis ($P=.44$). Each group generated a mean number of 4 differential diagnoses with two supporting factors for the correct diagnosis ($P>.30$).

Differences were seen in the ability to generate a problem list (Table 2). AIME students had on average one more problem listed for each patient (mean 8.4 vs 7.5; $P=.05$). Sixty-five percent of AIME students listed one or more psychosocial history items compared to 44% of controls ($P=.008$). There was no difference in Diagnostic Thinking Inventory scores.

Multivariable regression analyses did not significantly alter outcomes after controlling for baseline characteristics.

Curricular Evaluation

Fifty-six intervention students provided curricular feedback. Eighty-four percent reported that AIME was somewhat to very effective in teaching techniques to establish rapport, elicit patient preferences, develop problem lists and generate differential diagnoses. Ninety-five percent found it beneficial to learn communication and clinical reasoning in an integrative fashion. Ninety-eight percent rated self-reflection and observation as highly effective learning strategies. Seventy-five percent used techniques taught in AIME during other patient interactions. Of those who had not used the approaches, 72% stated they did not have an opportunity to practice, but hoped to use these skills in the future. For sixty-eight percent of students, role-play was rated as the most useful part of the curriculum, for 23%, the standardized patient encounter, and for 9%, discussion and feedback.

Facilitators felt strongly that role-play with time-outs allowed for meaningful discussion of communication and clinical reasoning and valued teaching these skills together [median of 1; interquartile range (1 to 2); 1=strongly agree; 4=strongly disagree]. Many facilitators felt that having additional instruction in role-play techniques would be beneficial. Half of the facilitators noted being more engaged in shared decision-making styles of communication with their own patients as a result of teaching in the curriculum.

CONCLUSIONS

We designed AIME to teach the connection between communication and clinical reasoning with an emphasis on understanding the connection between the biomedical and

Table 1. Baseline Student Characteristics, Self-rated Proficiency, and Application of Communication and Clinical Reasoning Skills

	AIME Students ($n=59$)*	Non-AIME Students ($n=60$)*
Baseline characteristics		
Age	24.4 years	24.1 years
Male gender (%)	50.8	50.0
College major (%)		
Science	66.1	76.7
Nonscience	11.9	13.3
Both	22.0	10.0
Previous interviewing experience (%)	66.1	48.3
Previous health professional training, %	33.9†	16.7†
Self-rated proficiency of skills, median (IQR)‡		
Communication skills		
Using verbal and nonverbal cues	4 (3–4)	4 (3–4)
Encouraging questions from patients regarding health/illness	3 (3–4)	3 (3–3)
Eliciting patients' beliefs about health or illness	3 (2–3)	2.5 (2–3)
Eliciting patients' expectations for tests or treatment	2 (2–3)	2 (2–3)
Clinical reasoning skills		
Creating a problem list	2 (1–3)	2 (1–3)
Using methods to develop a differential diagnosis	2 (2–3)§	2 (1–2)§
Students' observed assessment of a videotaped clinical encounter		
Recognizing physician communication behaviors (% of students)		
Data gathering		
Agenda setting	27.6	35.0
Interrupting the patient	37.9	41.6
Eliciting beliefs about illness	36.2	35.0
Establishing rapport		
Appropriate eye contact	87.9	88.3
Expression of empathy	72.4	76.7
Patient education and counseling	NR	NR
Clinical reasoning skills, mean (SD)		
Problem list		
Problems listed	5.9 (1.2)	5.8 (1.1)
History of present illness items	2.4 (0.8)	2.3 (0.8)
Differential diagnoses		
Diagnoses listed	4.4 (1.1)	4.3 (1.0)
Supporting factors for the correct diagnosis	2.1 (1.7)	1.8 (0.8)
Refuting factors for the correct diagnosis	0.15 (0.44)	0.06 (0.24)
Diagnostic Thinking Inventory total score	149.3 (15.5)	145.3 (14.8)
Clinical reasoning skills		
Psychosocial history items listed (% of students)		
No items listed	2	0
≥ 1 items listed	98	100

Data available for 119 of 121 students.
†P=.04 *by* χ^2 *analysis.*
‡*Median and interquartile range (IQR) for ratings of proficiency: 0=no exposure, 1=familiar with concept, 2=can perform skill somewhat, 3=can perform skill well, and 4=can teach to other students.*
§P=.01 *by Wilcoxon rank-sum test.*
AIME, An Integrated Medical Encounter; NR, not rated.

psychosocial aspects of patient care. We saw statistically significant differences in students' ability to establish rapport and to list more psychosocial history items on their problem lists. The majority of curricular students appreciated learning communication and clinical reasoning together. We did not see differences in the number of diagnoses generated or Diagnostic Thinking Inventory scores. This most likely reflected the limited opportunities students had to practice skills outside of AIME.

A report summarizing the efforts to integrate basic sciences and biopsychosocial medicine found that despite attempts at curriculum reform, "Basic science dominates; at best, biopsychosocial issues are treated as separate but equal—and often as separate and not equal."[25] Many issues contribute to the difficulties in teaching these skills in an integrated manner, including an already overburdened curriculum and limited faculty resources. To compensate, schools often teach medical history-taking and communication in the preclinical years while relying on the clerkships to provide clinical reasoning instruction. This dichotomous approach may limit students from understanding how communication affects the quality of the medical information obtained and how reasoning impacts communication. It may also lead students to undervalue the psychosocial history. Teaching the connection between communication and clinical reasoning together allows students to understand the important relation between the biomedical and psychosocial aspects of patient care.

Our work has several limitations. First, only 2 standardized patients evaluated students. This may have limited our ability to detect all of the differences that may have existed between groups. Second, students had minimal opportunities to interview patients outside of AIME. With more practice, both communication and clinical reasoning scores might improve. Third, we used multiple measures to determine differences in student performance. Although we did not adjust our tests of

Table 2. Comparison of Communication and Clinical Reasoning Skills Using Standardized Patient Encounters with Students Who Did and Did Not Receive the AIME (An Integrated Medical Encounter) Curriculum

	AIME Students	Non-AIME Students	*P* Value*
Communication skills, mean (SE)			
Interpersonal score ratings†			
Overall interpersonal score	3.72 (0.13)	3.62 (0.13)	.21
Data gathering	3.66 (0.15)	3.58 (0.15)	.35
Establishing rapport	4.09 (0.15)	3.91 (0.15)	.05
Patient education and counseling	3.09 (0.20)	3.03 (0.20)	.62
Clinical reasoning skills, mean (SE)			
Problem list			
Problems listed	8.4 (0.71)	7.5 (0.74)	.05
History of present illness items	4.6 (0.50)	3.8 (0.51)	.01
Differential diagnoses			
Diagnoses listed	4.0 (0.33)	3.9 (0.32)	.30
Supporting factors for the correct diagnosis	2.2 (0.26)	2.0 (0.25)	.43
Refuting factors for the correct diagnosis	0.36 (0.14)	0.44 (0.14)	.41
Diagnostic Thinking Inventory total score	165.4 (5.46)	164.0 (5.46)	.69
Clinical reasoning skills			
Psychosocial history items listed (% of students)			
No items listed	35	56	
$\geq$ 1 items listed	65	44	.008

**All analyses are adjusted for students' previous health professional training. Comparisons for supporting and refuting factors were made using the Wilcoxon rank-sum test. Comparisons for psychosocial history items were made by chi-square analyses. All other comparisons were made using Student's t-tests.*

†Interpersonal score ratings scale: 1 =poor, 2 =adequate, 3 =good, 4 =very good, and 5 =excellent. Each rating was based on an average score for both standardized patient cases and converted to a 5-point score based upon the number of items contained in each category (30 items for the overall interpersonal score; 5 items for each subscale).

statistical significance for multiple comparisons, the significant differences and the non-significant trends were consistently in the direction of improvement in skill acquisition with the curricular intervention. Finally, we only measured students' opinions regarding the value of learning communication and clinical reasoning together.

Teaching skills to bridge biomedical and psychosocial aspects of patient care promotes understanding the patient as a whole. This curricular intervention showed that these closely related yet often separately taught skills can be integrated and are valued when learned together. Educators may wish to incorporate communication and clinical reasoning skills early in training and offer reinforcement in the clinical years.

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Supplementary Material

The following supplementary material is available for this article online at www.blackwell-synergy.com:

Appendix 1. Sample Questions Contained in the Communication Skills Observation Guide Used During Student Role-play Encounters.

Appendix 2. An Integrated Medical Encounter Teaching Communication and Clinical Reasoning Skills: Curriculum Overview.

Appendix 3. Sample Time-Out Using a Six-Step Iterative Reflective Process to Integrate Communication and Clinical Reasoning Skills During Role-play.

Appendix 4. Communication Skills Items Rated by Standardized Patients.