Felix Ankel

From: Felix Ankel [ankel001@tc.umn.edu]
ent: Friday, March 11, 2005 11:00 AM
o: 'robert knopp'; 'Brent.R.Asplin@HealthPartners.com'
Cc: 'Won.G.Chung@HealthPartners.com'
Subject: RE: clinical variation among staff

This is an area close to my heart and one that Brad G and I have been discussing from time to time. Brad calls this nodes of expertise. To get on my soapbox

"My vision is to increase the amount of medical knowledge that is effectively translated from what is known and what is practiced. My goal is to develop curricula and lead educational systems that are learner centered, multi-disciplinary, web based, "open source", continuously available and accessible, experientially focused, and outcomes based. I believe creating innovative curricula, continuously mentoring students, residents, and faculty, and systematically capturing the wisdom of learners and teachers for dissemination best achieve this."

I think this translation piece is the rate limiting factor for quality care and have been setting the groundwork for a Regions EM defined best practice in care (rather than relying on interpretation of former clinician of external proprietary guidelines)

This is what is set so far.
1. EMREL library to archive and search residency wisdom (e.g. can search Knopp + UTI) 2. Emres listserve that facilitates dialogue between practitioners inside and outside the department 3. 18 month curriculum that addresses breadth of EM content 4. 20+ faculty with defined core content "expert" designation

This is what we have but haven't tapped into for this
Education volunteer willing to focus speakers to ensure didactics are of appropriate eadth AND depth and facilitate wisdom posted on emrel in organized manner 2. EMR implementation with ability to link potential diagnosis to Regions defined best practices

These are thoughts I've considered
1. Each resident (27) is a core content expert when they start the residency and is paired with the core content expert faculty. One of their administrative projects is to develop one best practice guideline/per year with their faculty expert. They also review the other guidelines with their faculty on a yearly basis. This will allow each graduating resident to have the breadth of EM knowledge with and area of specified depth plus the experience of writing clinical guidelines 2. The clinical guidelines are living documents where proposed updates are presented on the emres list. Residents and faculty can be instructed to use JADE for this (journal articles delivered electronically) in a push me method. 3. The regions clinical guidelines are cross referenced and linked to our EMR 4. All 27 areas are reviewed in conference as a state of the art panel with the resident and faculty. E.g. we would have a state of the art panel every two weeks (state of the art panels would be 10-15% of all conference time, this will still allow for "core" board type material)

I think great discussion piece for strategic plan. This is one way of reducing MD variation and falls in nicely within the IOM,IHI, Leapfrog, ?Partners for health indicatives (the GE leapfrog equivalent). I think it would be more robust than milliman or Interqual, it addresses acgme issues such as systems based practice and practice based learning, it ultimately will help patient acre and health care education, and can serve as the foundation of our academic research, educational, and operational initiatives for our department.

Thoughts??

- lix

-----Original Message-----
From: robert knopp [mailto:knopp003@umn.edu]
Sent: Tuesday, March 08, 2005 11:43 AM

To: Brent.R.Asplin@HealthPartners.com
Cc: Felix Ankel; Won.G.Chung@HealthPartners.com
Subject: clinical variation among staff

Over the past six months, a recurring question has been posed to me: a resident or staff indicates that they recently reviewed a state of the art paper or attended a conference that reviewed best practices in a certain area and that there is substantial variation in how we do things in our ED regarding clinical condition X such that we are not achieving what we should be doing. Most recently the issue raised was management of CHF. But examples of other issues include aspects of trauma care, mesenteric ischemia, appropriate use of heparin for PE, airway management, antibiotic use.

I know that there are other issues consuming a lot of time. However, I do think for the more common clinical problems we need a strategy to narrow the variability and increase the frequency with which patients are treated with the latest information.

Bob

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Health Professions Education

Using a Healthcare Matrix to Assess Patient Care in Terms of Aims for Improvement and Core Competencies

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In 2001, the Institute of Medicine (IOM) presented a compelling case for its claim that the difference between the "health care we have and the care we could have" represents much more than a gap, but rather a chasm,[1] and that the health care quality chasm persists alarmingly unchecked.[2,3] Unfortunately, a chasm also exists between the medical education that we have and that which we could have.[4,5] The IOM identified "reform of health professions education critical to enhancing the quality of health care in the United States."[1]

The challenge is to create a system in which the following are true:

- The care of every patient has the potential to improve the care of all patients yet to come
- Competencies are integrated into the routine practice of daily care
- Decision making regarding care of the patient is guided by the best evidence available
- The quality of health care is positively related to the quality of medical education.

The IOM recommended that to address the chasm in health care quality, all health care organizations, professional groups, and private and public purchasers pursue six Aims for Improvement in health care.[1] These "dimensions of quality" describe a health care system that is safe, timely, effective, efficient, equitable, and patient centered.

Article-at-a-Glance

Background: In 2001, the Institute of Medicine (IOM) recommended six Aims for Improvement; the dimensions of quality describe a health care system that is safe, timely, effective, efficient, equitable, and patient centered. In 1999, the Accreditation Council of Graduate Medical Education (ACGME) adopted six core competencies that physicians in training must master if they are to provide quality care. A Healthcare Matrix was developed that links the IOM aims for improvement and the six ACGME Core Competencies. The matrix provides a blueprint to help residents to learn the core competencies in patient care, and to help faculty to link mastery of the competencies with improvement in quality of care.

Healthcare Matrix: The Healthcare Matrix is a conceptual framework that projects an episode of care as an interaction between quality outcomes and the skills, knowledge, and attitudes (core competencies) necessary to affect those outcomes. For example, an anesthesiology resident used the Healthcare Matrix for a complex 18-hour episode of care with a life-threatening situation.

Ongoing Work and Research Agenda: Collecting and analyzing a series of matrices provides the foundation for systematic change in patient care and medical education and a rich source of data for operational and improvement research.

In 1999, the Accreditation Council of Graduate Medical Education (ACGME) focused on the shortcomings of graduate medical education (GME) and set the following goals:

- The content of graduate education is aligned with the changing needs of the health system
- Residency programs use sound outcome assessment methods for both the residents' and programs' achievement of educational outcomes[6]

The ACGME adopted six core competencies that physicians in training must master if they are to provide quality care. The American Board of Medical Specialties (ABMS) has adopted these same competencies as the basis for the standards of certification and maintenance of certification for all specialty boards,[7] making this framework equally valuable for all practicing physicians.

This article introduces a Healthcare Matrix that links the IOM Aims for Improvement and the six ACGME Core Competencies. The matrix provides a blueprint to help residents to learn the core competencies in their daily work of caring for patients and to help faculty to link mastery of the competencies with improvement in quality of care. The matrix also provides a framework for educators to use in curriculum and program redesign. Data collected in completing the matrix can be used to generate new knowledge for operational and outcome improvements and research for both resident education and the delivery of care.

Challenge of Teaching and Assessing the Core Competencies

Teaching and evaluating the core competencies essential for quality health care is an evolutionary process without a prescribed formula.[6] Most academic institutions have focused on identifying summative assessment tools to evaluate residents' acquisition of the competencies, which presumes that the competencies are being taught and learned effectively. In reality, teaching and assessing the less formally defined competencies—*professionalism*, *communication and interpersonal skills*, *systems-based practice*, *and practice-based learning and improvement*—has been problematic even for experienced clinicians and educators. Teaching *system-based practice and practice-based learning and improvement* has been especially daunting for faculty without experience in quality improvement.[8] For these reasons, and acknowledging the dependency of quality medical education on the presence of quality medical care and improvement, we introduce a formative approach to the presentation of the core competencies to residents, which in turn is having an effect on the faculty and their patient care.

The Healthcare Matrix

The Healthcare Matrix (Figure 1, page 101) is a response to the challenge of linking all six competencies mandated by ACGME with the realities of the current system of medical education, which is usually more focused on the acquisition of medical knowledge. It is a conceptual framework that projects an "episode of care" as the large and complex picture that it is yet provides a glimpse into the interaction between quality outcomes (IOM Aims for Improvement) and the skills, knowledge, and attitudes (ACGME Core Competencies) necessary to affect those outcomes. The matrix is intended to make readily apparent the tight linkage between competencies and outcomes.

The first row (Patient Care) is meant to be an assessment of the quality of the care. For example, was care safe? If the answer is "yes," this is written in that cell. Was care timely? If it wasn't, the cell gets a "no." Next, for each column that receives a "no," the four specific ACGME competencies (medical knowledge, professionalism, system-based practice, and interpersonal and communication skills) are examined in terms of their contributions to the care of the patient. Finally, suboptimal performance is synthesized into the implementation of improvement strategies (practice-based learning and improvement).

Two examples are provided to illustrate our pilot work with the Healthcare Matrix in two different resident learning settings. A facilitator [D.C.Q.] first attends a typical case or mortality and morbidity (M&M) conference and documents the presentation and discussion on a blank matrix framework. She then shares the matrix with the group as a means of discussing the six competencies, highlighting what was missed of the competencies. Sometimes the matrix is sent to the resident for additional reflections (see Example 2, page 103). Eventually, the residents will use the matrix to prepare their case presentations and M&M conferences. The most beneficial

Healthcare Matrix for a Patient with Pregnancy and Disseminated Intravascular Coagulopathy

IOM / ACGME	SAFE[1]	TIMELY[2]	EFFECTIVE[3]	EFFICIENT[4]	EQUITABLE[5]	PATIENT-CENTERED[6]
Assessment of Care						
I. PATIENT CARE[7] (Overall Assessment)	Despite direct medical attention, patient nearly died from hemorrhagic shock	Life saving treatment was delayed for variety of reasons	Delays in treatment impaired effectiveness of therapy	Resources (blood products, staff time) were not utilized in an efficient manner.	Did patient's ethnicity, socio-economic, education status influence the level of care she received? Did the time of night influence care?	Patient was not adequately apprised of her own health problems and did not participate fully in her care decisions
II. a MEDICAL KNOWLEDGE[8] (What must I know)	Priorities in hemorrhagic shock are ABC: ensure oxygen delivery, support BP, aggressive IV resuscitation, treat cause	Hemorrhagic shock is life-threatening emergency: Prompt diagnosis, recognize urgency, initiate therapy, incl. timely transport to OR. Diagnosis was made late. No urgency to treat. Delay in contacting Anesth. Inadequate assistance in transport to OR	D.I.C. in pregnancy: Physiology, diagnosis, causes, treatment. Regional v. General Anesth? Post resuscitation pulmonary edema. Hypocalcemia due to massive transfusion. Invasive monitoring indications. Pharmacology of uterotonic drugs.	Survival in postpartum hemorrhage requires aggressive IV resuscitation: always consider combining procedures (start 2nd IV while drawing blood sample for transfusion cross match).		
II. b INTERPERSONAL AND COMMUNICATION SKILLS[9] (What must I say)	Safety is jeopardized unless team members are fully apprised of patient's condition (blood loss following delivery, vital signs, plans for intervention).	Orders (blood cross match) must be prioritized and fully implemented in a timely fashion.	Effectiveness of life-saving intervention depends on effective communication between team members.	Communications of a defensive or argumentative nature are counter-productive to efficient and sage care. The focus should be patient care, with analysis of misunderstandings at a later time.		Must communicate patient's condition and intended interventions (blood transfusion, emergency hysterectomy), and in a way that is understandable and useful to the patient, respecting patient autonomy.
II. c PROFESSIONALISM[10] (How must I act)			Professional duty to accompany critically ill patient to the OR, to ensure safety, and to expedite therapy.		Patient's ethnic, socio-economic, "service patient" status should have no effect on quality of care.	Professional duty to attempt to preserve patient autonomy (make sure patient understands situation and interventions)
II. d SYSTEM-BASED PRACTICE[11] (On whom do I depend and who depends on me)	System must ensure that appropriate consultants are notified when needed to ensure safety in life-threatening medical condition.	During postpartum bleeding, type & cross match must be drawn, sent, and verified promptly. Failure to do so threatens life.	Failures to draw, send, and verify cross match blood sample jeopardizes effectiveness of life-saving therapy.		Standard of care should not vary due to differences in staffing that results from time of day / night (availability of lab medicine physician, timely transport of blood samples, adequate number & expertise of obstetrics, anesthesiology, & nursing staff)	
Improvement						
III. PRACTICE-BASED LEARNING AND IMPROVEMENT[12] (How must I improve)	Policy and procedure changed for Mom/Child in trouble	Revise the criteria for and system of communicating urgent/emergent request for Anesthesiology consultation	Departmental Teaching Conference on management of parturient with D.I.C.	Procedure outlined for fastest prep for OR		Increased awareness of need to consider patient centeredness even in emergent or crisis situations. Communication with father / family members when appropriate and possible.
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Figure 1. *The use of the Healthcare Matrix to analyze a complex episode of care that took place in the course of 18 hours and involved a life-threatening situation is described in Example 1. The most important cells are outlined. ACGME, Accreditation Council of Graduate Medical Education; IOM, Institute of Medicine; IV, intravenous; OR, operating room. The IOM dimensions of care and the ACGME Core Competencies are explained in the legend for Figure 2.*

learning comes from the residents having to think about each cell as it relates to their presentation.

Example 1. Anesthesiology Resident

The first example presents the learning experience of a resident who used the Healthcare Matrix to analyze a complex episode of care that took place in the course of 18 hours and involved a life-threatening situation. The matrix prompted the resident and other team members to look beyond the compelling medical issues to explore the significance of competencies and dimensions of care that represented the real threats to life in this case. Ultimately, this exercise led to consideration of process changes designed to improve care.

A senior anesthesiology resident and her supervising attending [M.R.G.] were summoned urgently in the middle of the night to provide anesthesia for a young mother who had delivered a healthy term infant an hour earlier. Postpartum bleeding necessitated uterine exploration under anesthesia. Initial assessment revealed hypovolemic shock and continuing vaginal bleeding but only a single intravenous (IV) line. A call to the blood bank revealed that no blood was immediately available because the patient's blood sample had been received only five minutes earlier. Suspecting disseminated intravascular coagulopathy (DIC), the anesthesia team immediately placed a large-bore IV and began aggressive resuscitation with IV fluid and type-specific but uncrossmatched blood products. Within 15 minutes the patient's vital signs stabilized and her symptoms of shock resolved. During the next 1½ hours, she underwent a life-saving peripartum abdominal hysterectomy, with > 5 liters of blood loss and a total of 7 liters of IV fluid and 31 units of various blood products transfused. She subsequently experienced pulmonary edema on the first postoperative day, a further decrease in hematocrit (requiring additional blood transfusions), and symptomatic hypocalcemia due to massive transfusion, yet was discharged home on her fourth postoperative day.

This highly complex episode of care was replete with learning points in all core competencies and dimensions of care—medical knowledge and patient care issues (chorioamnionitis, pathophysiology and treatment of DIC, massive transfusion, and so on), professionalism/ethical issues, equity, timeliness of communication, effectiveness of teams, systems (protocols for consultation and crisis prevention and management), and practice-based improvement. In fact, although the DIC was a life-threatening development, these other system-related factors lay at the heart of this near miss. Considering the patient's age and parity, it must be argued that the catastrophe was not completely averted because her fertility was permanently sacrificed.

The case formed the basis of an extended resident learning exercise. The attending asked the resident to write a detailed account of the peripartum course, including all clinical details, events, team communications, and time line. The resident was also to compile an exhaustive list of "important learning topics and issues prompted by reflection of the details of this case (no particular order)." The attending anesthesiologist performed the same exercise independently.

The resident's list of learning topics was as follows:

1. DIC—what is it?
2. DIC in pregnancy—what are the causes?
3. Fibrinolysis in DIC (significance of an in vitro clot test)
4. Local anesthetic toxicity
5. Postpartum hemorrhage with regional anesthesia versus general anesthesia
6. Pulmonary edema secondary to massive transfusion/volume resuscitation
7. Hypocalcemia from massive transfusion
8. Blood-tinged epidural aspirate—significance?
9. Carboprost, misoprostol, and methylergonovine maleate-indications and uses
10. Third-spacing—can specific IV fluids prevent it?
11. Arterial-line indications—use with massive transfusions or not?
12. Who needs a type and cross? Why does it take 30 minutes?

Of the 12 learning points, all but one (point 12) focused entirely on the intersections between the competencies *medical knowledge* and *patient care* and the dimensions *effectiveness* and *safety*—representing only 4 of the 36 cells of health care. Learning point 12 included the Systems/Timeliness cell.

The attending physician inserted his recollections into the resident's narrative, focusing especially on the team interaction and communication issues omitted

from the resident's draft. He then asked the resident to use the Healthcare Matrix to discuss the individual competencies and dimensions and the implications of the intersecting cells. He explained how this episode of care and other episodes of care could be viewed in terms of each of the cells, with reflection on what was done and how the various facets of care contribute to the outcome, and ultimately consideration of what was done well and what was suboptimal and could benefit from improvement.

The resident returned a matrix that was much richer, now including entries in 17 of 36 cells (Figure 1). The resident chose to use this case for a one-hour, departmental senior resident case presentation identifying the learning points she wished to include. Approximately two-thirds of her presentation focused on the scientific and clinical aspects of normal and abnormal homeostasis, and the management of DIC. The final third of her presentation centered on the systems, communication, and team issues that contributed to the near-catastrophic outcome, introducing these by way of the Healthcare Matrix model. During the 15-minute discussion period, questions and comments offered by faculty and residents in attendance concerned the many cells representing the intersections of competencies (especially communication, systems-based practice, professionalism, practice-based learning and improvement) and dimensions of care (especially safety, timeliness, patient-centeredness, equitability, effectiveness).

The resident's presentation of this case prompted the obstetrical anesthesiology faculty to partner with the obstetricians and obstetric nursing staff to improve the team's processes involved in responding to urgent obstetrical situations. During a debriefing interview with one of the authors [D.C.Q.], the resident reflected on the learning exercise and the matrix's usefulness in contributing to her learning. The resident viewed the Matrix as pivotal to opening her eyes to the many competencies other than medical knowledge which are critical to optimal healthcare delivery. Based on this presentation, the Department of Anesthesia will use the Matrix to frame M&M conferences.

Example 2. Psychiatry Resident

In a second example, the Healthcare Matrix was used to enhance learning in a psychiatry resident case conference. In the matrix for this example (Figure 2, page 104) the resident's additional content is initialed [WH]). The psychiatry residents now use the matrix to prepare their case conference presentations, and the program director uses it to ask questions during the presentations. Two lessons learned by the residents are that not all cells need be filled in and that it is helpful to border the most important cell(s) in red.

Creating and Reinforcing a Culture of Learning

The matrix is intended to help consider patient care in terms of the IOM Aims and the ACGME Core Competencies rather than make these dimensions add on to an already compressed duty-hour week. Faculty use the matrix to enhance the learning experience for every resident. We are slowly creating an environment where learning can occur with other members of the team, where data are gathered and reviewed, and where decisions are made in a collaborative manner rather than in an environment characterized by "embarrassment, blame, shame and sometimes humiliation"[9] for the residents. This new learning environment represents a shift in culture that acknowledges the resident as part of a system of care, in which he or she learns *in* and *about* the system of care.

The matrix provides a common framework for evaluating and improving patient care across all disciplines. For example, pediatrics residents are teaming up with the nursing staff and managers to improve the residents' continuity clinic. The residents had identified many system issues in care of a child with asthma, and when they brought this to the attention of the nursing manager, she stated that a team was already working on those issues. The pediatric residents were then invited to be part of the process flow team. When the matrix was used to analyze suboptimal outcomes associated with femoral vein cannulation, faculty and residents established a multidisciplinary team to decide on orders, policies, and procedures for venous cannulation.

Ongoing Work and Research Agenda

The Healthcare Matrix is being used in a variety of settings and is the focus of a research agenda.

Healthcare Matrix for Care of a Patient with Schizophrenia (and Auditory Hallucinations)

IOM / ACGME	SAFE[1]	TIMELY[2]	EFFECTIVE[3]	EFFICIENT[4]	EQUITABLE[5]	PATIENT-CENTERED[6]
	Assessment					
PATIENT CARE[7] **Overall Assessment**	NO This patient is at risk for suicide.	NO Not timely from adolescence and too many providers delayed good care.	NO Medication regime NOT effective.	NO Not efficient in medication use.	Not sure this was a problem Minority male who had prison record.	NO Many different healthcare systems failed this person.
MEDICAL KNOWLEDGE[8] **(What I must know)**	Medications: significant part of treatment. Knowledge of type, dosage, when to add, Clozapine only drug that can prevent suicide. (WH) Algorithm would be helpful. Suicide ideation at each visit but formal suicidality plan developed with patient and mother would be beneficial	Probably not well medicated and treated during early adolescence (prodromal). Psychosis was allowed to "set in" because of delay in getting treatment. (WH) Schizophrenia algorithm which is being developed would have helped this patient. School based education for early warnings signs of mental illness would have been helpful.	Medications: typical vs atypical. Actions, tissue residual, when to change and how. Dr. M has algorithm for drug therapy. Believes and stop and switch with no cross-tapering. Look at EBM. (WH) Recommend putting algorithm online, having an allotted daily time to consult with attendings on the more difficult cases would be helpful in better delivery of effective, EBM-care	Try mono-therapy first and add as needed. Don't try treating every symptom from the beginning. (WH) Algorithm	Effects of race, gender, Socio-econ status, on Dx of Schizo? (WH) Would be interesting to look at age, sex and diagnosis (with equivalent ages of onset) matched CAPOC patients with similar diagnosis to see whether they receive compatible care.	Cognitive impairment with Schizo is severe and cannot deal with life stresses despite average IQ. (WH) Feel that multi-dimensional team looking at all aspects of patient's life might provide patient with more opportunities to function, community-ie automatic neuropsych testing for pre-existent learning disorders, occupational assessment, etc.
PROFESSIONALISM[9] **(How I must act)**		Family MD had sleep med ordered, but was totally inadequate. Created more delays in helping him. (WH) Knowing standard of care for patients with schizophrenia is duty of physician.	Pharmacologically there were problems with his Tx. Should have some communication with community physicians who did not know best Tx for this serious illness.			Attitude of past history of convictions and jail time, of ETOH and drug use, poor personal hygiene and obesity.
INTERPERSONAL AND COMMUNICATION SKILLS[10] **(What I must say)**	Suicidal ideation: Accusation of probation violation led to overdose of meds. Feels "hopeless" which is key symptom to watch. (WH) Seeing patient on regular scheduled basis – discuss frequency of tx with supervisor/team. Have open communication with caregivers. Have family involved.	(WH) Having specific time slot each day in MH clinic during which expectation will be that psychiatrist communicate with PCPs, school counselors, consulting physicians. Initially feel attempted phone contact would be indicated followed by other means of communication – email, fax, etc… having permanent liaison (i.e. social worker) for TNCARE patients at CAPOC would allow external community to interact with someone until treating psychiatrist could call/email back.	Patient needs to have insight into his illness and be offered hope that it can be treated. (WH) As communication skills can be taught and innately developed and individuals have varying levels of expertise, an initial helpful aid for educating patients would be to develop templates which can be accessed by treating psychiatrist (preferably online) which would be a suggested "idealized" discussion for providing patient with insight and hope into his illness (taking into account resources available to patient/family in this community). This can then be modified by individual psychiatrist as he/she develops greater communication skills, knowledge, etc…			He is ashamed of his situation, does not want to talk about it, family situation difficult with 3 younger brothers. (WH) Involvement of family members could be improved. Would consider having intermittent appointments with entire family in the future. Having permanent social worker at CAPOC to facilitate interactions with families would be extremely helpful. Mother supportive, 3 brothers (normal) who may not understand illness. Patient feels very ashamed. (WH) Attempt to have intermittent family meetings. Again having a "treatment team" working within the clinic for more intensive patients would be helpful.
SYSTEM-BASED PRACTICE[11] **(On whom do I depend and who depends on me)**	Support groups to help him understand his illness. (WH) Patient should be assigned to one of the clinic groups, communication lines between PCPs, consulting physicians could be improved to allow external non-psychiatric tx providers means with which to quickly contact psychiatrist should need arise. Social worker liaison would be very beneficial in this capacity.	No mechanism in HC system to pick up young people with mental health issues like this. (WH) School-based education from elementary school kids upward with improved means for getting "kids" assessed and into the "system" could be developed. More school-based mental health clinicians.		(WH) Possible development of multidimensional team at CAPOC could have provided patient with a higher intensity of tx at the outset of illness, thus providing more efficient service.	(WH) Multidimensional team looking at different facets of patient's life might open up opportunities for work for patient. At this juncture, for a patient of this intensity, tools are cumbersome to provide a higher level of care.	(WH) Discussing issues of countertransference with supervisor team which might occur with patient and not having limited expectations for patient based on prior experiences. What does the literature say? How will the mother be supported since she is so worried about suicide? She has moved in with son. What other resources are available? Church, other HC resources?

continued

Healthcare Matrix for Care of a Patient with Schizophrenia (and Auditory Hallucinations), *continued*

ACGME / IOM	SAFE[1]	TIMELY[2]	EFFECTIVE[3]	EFFICIENT[4]	EQUITABLE[5]	PATIENT-CENTERED[6]
	Improvement					
PRACTICE-BASED LEARNING AND IMPROVEMENT[12] (How must we improve)	(WH) Improved knowledge of practice parameters, medication side effects, etc…	(WH) Better use of online tools and creating time within the day while in clinic to use them. Daily allotted time to consult with supervisors on patients seen that same day. Possible, "psychiatric attending du jour" who is available to treating physicians at various times throughout day.	Look at research Dr. M is doing to see hypotheses and new Tx options. (WH) Continued learning and review of practice parameters for schizophrenia. Using algorithm.	What does literature say about meds and how to create (algorithms) for better Treatment with no delays? (WH) Knowing where to find treatment of choice algorithms and how to access them quickly.	(WH) External and regular review of our treatment of patients by MD psychiatrists. If algorithms developed by "specialists" within our department, made widely available, distributed online and discussed, the external review should become superfluous.	What has been learned with this patient that could help him? (WH) Need to stress importance of involvement of intimate family members and other people within the "systems" that patient exists and care of the patient if at all possible. Learning how to do this in the most efficient manner.
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1 Safe: Avoiding injuries to patients from the care that is intended to help them.

2 Timely: Reducing waits and sometimes harmful delays for both those who receive and those who give care.

3 Effective: Providing services based on scientific knowledge to all who could benefit and refraining from providing services to those not likely to benefit (avoiding underuse and overuse, respectively).

4 Efficient: Avoiding waste, including waste of equipment, supplies, ideas, and energy.

5 Equitable: Providing care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographic location, and socio-economic status.

6 Patient-Centered: Providing care that is respectful of and responsive to individual patient preferences, needs, and values and ensuring that patient values guide all clinical decisions.

7 Patient care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health.

8 Medical Knowledge about established and evolving biomedical, clinical, and cognate sciences (e.g. epidemiological and social-behavioral) and the application of this knowledge to patient care.

9 Interpersonal and communication skills that result in effective information exchange and teaming with patients, their families, and other health professionals.

10 Professionalism, as manifested through a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse patient population.

11 System-based practice, as manifested by actions that demonstrate an awareness of and responsiveness to the larger context and system of health care and the ability to effectively call on system resources to provide care that is of optimal value.

12 Practice-based learning and improvement that involves investigation and evaluation of their own patient care, appraisal and assimilation of scientific evidence, and improvement in patient care.

Figure 2. *This Healthcare Matrix was used to enhance learning regarding the case presented as Example 2. The most important cells are outlined. ACGME, Accreditation Council of Graduate Medical Education; IOM, Institute of Medicine; Dx, diagnosis; EBM, evidence-based medicine; CAPOC (Child/Adolescence psychiatric outpatient care); Tx, treatment; ETOH, alcohol; PCP, primary care physician; TNCARE, Tennesee's Medicaid managed care system; HC, health care.*

Multiple Uses in Different Specialties

The Healthcare Matrix is being piloted at Vanderbilt University Medical Center and elsewhere in many specialties, including not only anesthesiology, psychiatry, and nephrology but also emergency medicine and internal medicine–ambulatory. It is also being used as a framework for transforming traditional M&M conferences into Morbidity and Mortality and Improvement conferences. The Children's Hospital at Vanderbilt University Medical Center has created a structure titled Performance Management and Improvement (PM & I) that includes use of the matrix for team learning. We have some positive preliminary data on how the matrix is helping to expand the context of learning for the residents and faculty but more data will be gathered to further validate the tool.

Enhancing Personal and Professional Development

Dreyfus and Dreyfus[10] teach us that novices benefit from algorithms and structured approaches to learning. Residents learn heuristics from textbooks, mentors, chief residents, faculty, and others. For example, all students learn to take a complete history and perform a thorough physical examination, a time-consuming process. When they know more about patient assessment, students are able to perform a focused version of the "history and physical." Likewise, the resident struggles with this matrix at first, but with experience becomes more facile with the tool, taking less time to complete matrix cells. The matrix provides a valuable technique for the clinician-educator to zero in on the aspects of care that are most important in the presentation of a given case.

At the conclusion of an episode of care, a resident and his or her attending physician debrief with the following questions, which address all cells in the matrix:

1. Was care for this patient as good as it could be?
2. What improvements in the competencies of the resident and faculty and changes in the system of care would result in improved care for the next patient?

Although a completed matrix provides a large amount of information, focusing learning at the "cell" level keeps the learner from feeling overwhelmed with all the dimensions of care. It is useful to ask "Relative to this patient condition, what knowledge do physicians need to know to improve patient safety?" or, "What cell or few cells had the greatest impact on this outcome, and why?"

Completing the matrix cells should itself teach all the core competencies. As learners seek to improve the systems, they will become competent in practice-based learning and improvement. A recent article by Ogrinc et al.,[8] which describes a framework for teaching medical students and residents about practice-based learning and improvement, should help residents use the matrix.

Documenting Learning

A completed Healthcare Matrix documents the ability to reflect on outcomes for a patient or panel of patients in terms of the gap between the care provided and the care that could be provided and encourages reflection on how this knowledge can be used to improve care. As improvements in care are made, patient outcome can be compared to assess their effectiveness. The matrix also provides a useful basis for documenting formative feedback as part of a summative evaluation. Instead of the faculty having to decide if the learner demonstrated the competencies, the resident will provide faculty with his or her portfolio and the learning/reflections related to patient care. We are developing an electronic portfolio to accommodate required data (duty hours, procedures, and so on) and data from the Healthcare Matrix.

Research Agenda

The Healthcare Matrix provides a framework for clinicians and teams to improve care of patients. Collecting and analyzing a series of matrices provides the foundation for systematic change in patient care and medical education, as well as a rich source of data for operational and improvement research. We are planning a qualitative research project in which examination of the completed matrices for each specialty will help identify the "quality characteristics" important for each specialty. We hope to be able to identify evaluation tools appropriate for each specialty. We are now tracking data over time from cells from matrices completed by ambulatory medicine residents to create a balanced set of measures to assess progress in patient care and resident education. J

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Using Patient Care Quality Measures to Assess Educational Outcomes

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Abstract

Objectives: To report the results of a project designed to develop and implement a prototype methodology for identifying candidate patient care quality measures for potential use in assessing the outcomes and effectiveness of graduate medical education in emergency medicine.

Methods: A workgroup composed of experts in emergency medicine residency education and patient care quality measurement was convened. Workgroup members performed a modified Delphi process that included iterative review of potential measures; individual expert rating of the measures on four dimensions, including measures quality of care and educational effectiveness; development of consensus on measures to be retained; external stakeholder rating of measures followed by a final workgroup review; and a post hoc stratification of measures. The workgroup completed a structured exercise to examine the linkage of patient care process and outcome measures to educational effectiveness.

Results: The workgroup selected 62 measures for inclusion in its final set, including 43 measures for 21 clinical conditions, eight medication measures, seven measures for procedures, and four measures for department efficiency. Twenty-six measures met the more stringent criteria applied post hoc to further stratify and prioritize measures for development. Nineteen of these measures received high ratings from 75% of the workgroup and external stakeholder raters on importance for care in the ED, measures quality of care, and measures educational effectiveness; the majority of the raters considered these indicators feasible to measure. The workgroup utilized a simple framework for exploring the relationship of residency program educational activities, competencies from the six Accreditation Council for Graduate Medical Education general competency domains, patient care quality measures, and external factors that could intervene to affect care quality.

Conclusions: Numerous patient care quality measures have potential for use in assessing the educational effectiveness and performance of graduate medical education programs in emergency medicine. The measures identified in this report can be used as a starter set for further development, implementation, and study. Implementation of the measures, especially for high-stakes use, will require resolution of significant measurement issues.

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Graduate medical education (GME) programs are expected to graduate residents who can practice competently and independently.[1] Ideally, the newly graduated, competent physician will be able to provide quality care: care that is effective, safe, efficient, timely, equitable, and patient centered.[2] An assumption of the Accreditation Council for Graduate Medical Education's (ACGME's) general competency and outcome assessment initiative is that resident physician competence results when GME programs provide learning opportunities that foster residents' development in the six general competency domains established by the ACGME[3] and the American Board of Medical Specialties.

Patient care settings are a primary venue for resident learning. Acquisition of competency occurs as residents care for patients with the assistance of more experienced physician teachers. This includes applying input and feedback from their teachers and modeling their teachers' care processes. Therefore, quality of care for patients treated and managed in learning environments is directly attributable, at least in part, to the capabilities and competence of residents and their teachers and is indirectly attributable to other features of the educational program that contribute to learning.

Hospital and practicing physician performance are already being assessed using quality-of-care measures, such as desired patient outcomes and condition-specific care processes associated with desired outcomes.[4,5] Similar measures, selected or adjusted for use in educational environments, could function as educational outcomes. These indices would directly measure the extent to which residents have learned to provide quality care and indicate the educational effectiveness of the program. These measures could add value by indicating specific ways patient care performance needs to change. This type of feedback is not an inherent quality of the current, most commonly used methods for assessing resident learning and performance, that is, clinical performance ratings and written examinations. The patient care quality measures could also function as indicators of the educational potential of the patient care and learning environment.

Use of patient care process and outcome measures for assessment by residency programs would align with the ACGME's phase 3 implementation guideline for the Outcome Project.[6] The phase 3 goal is to integrate the general competencies and patient care and to begin using external measures, such as quality-of-care indicators, to assess program performance. Associating competencies with quality-of-care measures and linking competencies with educational experiences whereby they are fostered could help elucidate ways to improve education, resident performance, and patient care.

Candidate measures for assessing emergency department (ED) care quality have been presented in three recently published reports.[7–9] They include some of the disease- and condition-specific measures currently used at a national level for hospital performance assessment and improvement. To the best of our knowledge, however, no one has examined whether these or other patient care quality measures would be appropriate or useful for assessing emergency medicine (EM) residency education. This article reports the results of a project designed to develop and implement a prototype methodology for identifying and evaluating candidate patient care quality measures for potential use in assessing the outcomes and effectiveness of GME in EM.

METHODS

The measure identification and evaluation activity took place through the following activities: 1) construction and orientation of the GME and Patient Care Quality Workgroup that functioned as the expert panel; 2) performance of a six-phase modified Delphi process, involving the workgroup and external stakeholders as raters of the candidate measures; and 3) construction and application of a framework for examining the validity of the measures for assessing residency educational effectiveness. Figure 1 presents a more detailed overview of the steps.

Construction and Orientation of the Workgroup

The GME and Patient Care Quality Workgroup was the primary development group. The main selection criteria for group members was expertise in residency education and/or quality measurement. A criteria for the overall group composition was representation of the major stakeholder groups in EM: the Residency Review Committee (RRC), American Board of Emergency Medicine, American College of Emergency Physicians, Society for Academic Emergency Medicine, and Council of Emergency Medicine Residency Directors. Potential members were identified through peer nominations, publication records, their involvement in high-profile activities in residency education, or physician performance measurement. Members were invited to participate by the workgroup chair.

The workgroup exhibited the following characteristics. There were four members of the RRC from three appointing bodies. Six of the workgroup members had one or more primary organizational affiliations, as determined by board or committee membership within the organization; the other members were not actively engaged in EM organizations. Including the RRC members, organizational representation in the workgroup was as follows: American College of Emergency Physicians (n = 3), American Board of Emergency Medicine (n = 1), Society for Academic Emergency Medicine (n = 6), and Council of Emergency Medicine Residency Directors (n = 3). Among the Council of Emergency Medicine Residency Directors members were a current program director, an associate program director, and a distinguished educator. An American Board of Emergency Medicine executive staff member attended and observed the workgroup meetings. All workgroup members had expertise in quality and performance measurement, residency education, or both, as evidenced by records of scholarly publication and positions held (e.g., residency program director, chief of hospital quality, or representative to the American Medical Association's Consortium on Physician Performance Improvement [n = 2]). One of the quality experts was a cardiologist. Nine of the workgroup members (all physicians) participated in all aspects of the measure identification and discussion as described in the following text. The remaining members participated in a subset of the processes.

Orientation of the workgroup consisted of presentation of the project aims and the rationale for considering patient care quality and outcome measures for assessing

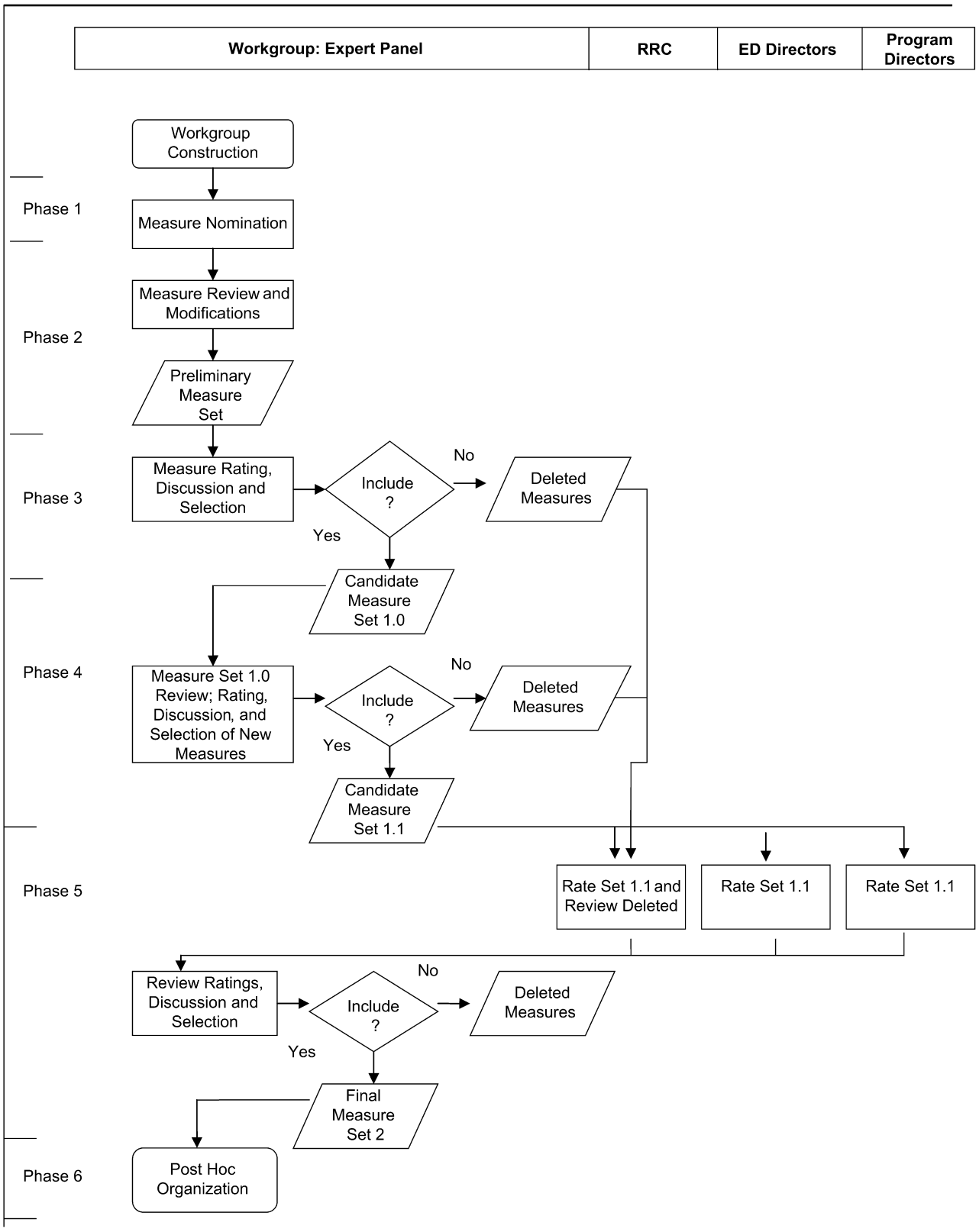

Figure 1. Modified Delphi process flow. RRC = Residency Review Committee Members.

resident and residency program performance. This was followed by a structured exercise during which workgroup members generated and discussed factors that could account for good and poor patient care process and outcome measures in an ED where resident physicians were learning and providing care. Five readings that discussed quality of care measurement in EM were provided in advance of the meeting.

Modified Delphi Process

The workgroup adapted the modified Delphi methodology used by Lindsay et al.[7] to this project's unique aim of exploring the link of the patient care quality measures to residency education. A modified Delphi methodology was selected because it allows a group to develop consensus by systematically assessing an expert panel's agreement or disagreement on complex issues. Two or more rounds of voting on issues are conducted, and areas of disagreement are resolved by discussion within the expert group.[10–12] This study's approach also included features from the RAND appropriateness methodology (RAM), specifically, a relatively small Delphi panel of nine members and the RAM quantitative definition and criterion for establishing agreement.[13]

Phase 1: Nomination of Measures for a Preliminary Set

The first phase of the workgroup's activity was to construct a list of potential measures appropriate for assessing quality of care provided by resident physicians in the ED. Individual workgroup members submitted their recommended measures. These measures were compiled into a preliminary list. During a conference call, the workgroup reviewed this compilation of potential measures and made additional suggestions. No items were removed from consideration at this phase of the activity. The list was then further refined by linking measures to clinical conditions (where appropriate) and by organizing the measures into four categories: clinical conditions, medications, tasks and procedures, and departmental efficiency.

Phase 2: Review of the Preliminary Measure Set against Criteria and Refinement of the Preliminary Measure Set

In phase 2 of measure development, during a second conference call, workgroup members reviewed the preliminary list of measures again to determine whether 1) the measures were representative of the spectrum of ED clinical conditions for patients of various ages and clinical acuity and 2) the clinical conditions identified were common reasons for which emergency care is sought and treated in most EDs. Measures were refined during the course of the group discussion, and gaps were identified. Individuals generated additional measures after the meeting to fill the gaps in accordance with assignments made during the conference call. During the conference call, the workgroup also identified the three critical dimensions of an appropriate measure: 1) importance, 2) measures quality of care, and 3) measures educational effectiveness. The degree to which a measure fit the dimensions was used as the basis for including or excluding individual measures in the next phase of the Delphi process. The group identified a fourth dimension, "feasible to measure," to collect input on the probability that a measure could be implemented.

Phase 3: Workgroup Ratings, Discussion, and Selection of Candidate Measures for Set 1.0

In the third major phase of the measure identification process, workgroup members individually rated each of the conditions, procedures, and specific measures. Each condition, procedure, and departmental efficiency measure was rated from 1 (not important) to 9 (very important) on the importance dimension. This dimension indicated high prevalence in the ED. Specific measures were rated on "measures quality of care" and "feasible to measure" using a scale of 1 (strongly disagree) to 9 (strongly agree). Response options for "measures educational effectiveness" ranged from 1 (not at all) to 9 (to a great extent). "Measures educational effectiveness" was defined as the extent to which the measure is attributable to effectiveness of teaching and learning and clinical performance within the residency (and not external factors).

The ratings were aggregated and provided to the workgroup members at a face-to-face meeting where the results were reviewed and discussed. Each member also received his or her own ratings. A mean score of 5 on the three dimensions of importance, quality of care, and educational effectiveness was set as a screening criterion for measure retention. The workgroup agreed to discuss measures with borderline mean scores with the understanding that criterion-based decisions could be overridden by a consensus of the group. Feasibility was not considered for purposes of measure selection and retention, because the aim was to identify measures that were substantively appropriate. In addition, the workgroup believed that feasibility would depend on local resources. As a result of this review and the accompanying discussion, 40 measures were dropped and 50 measures were retained, including three new measures defined and voted on during the meeting.

Phase 4: Review of Candidate Measure Set 1.0 for Representativeness; Rating, Discussion, and Selection of New Measures; and Location of Evidence

Two workgroup members conducted a postmeeting review of the measures for representativeness against the Model of the Clinical Practice of EM.[14] The measures identified as a result of the review along with other previously identified but unrated measures were scored and aggregated and later reviewed and discussed utilizing the same approach described previously. Two new clinical conditions and 15 measures were retained. Two members of the workgroup compiled external evidence for the measures as measures of patient care quality. The search for evidence was limited to evidence-based reviews and documented development, use, or endorsement of the measures by major medical or quality improvement organizations.

Phase 5: External Stakeholder Ratings, Workgroup Discussion, and Construction of Final Candidate Measure Set

Because the project goals were novel, external validation of the workgroup's ratings and selections was sought. Thirty-four individuals from three stakeholder groups were invited to participate by rating the candidate set of measures. The 20 individuals who accepted the invitation and completed the ratings were seven RRC members, five ED directors, and eight program directors. The RRC members were those who had not participated in the workgroup; the ED directors were volunteers from a larger group of 14 who were invited because of their participation in a focus group convened by the American College of Emergency Physicians to discuss recent

graduates' performance. The program directors were from a larger group of 13 nominated by workgroup members. The external stakeholder raters composed a convenience sample associated with major stakeholder groups in EM. None of the participants had seen results from earlier phases of the measure identification process.

Each of the external stakeholder group members individually rated the phase 4 candidate measure set 1.1 on the four dimensions. The RRC group was asked to review the measures that had been dropped in the preceding phases and to identify any that should be put back. Three previously dropped measures were recommended for reinclusion. All raters were also asked to suggest additional measures.

Mean ratings were calculated for each group separately. At its final meeting, the workgroup reviewed and compared the mean ratings from each of the three stakeholder groups and the mean across all three groups with the workgroup's own mean ratings and the previously defined criteria. As a result of the consensus discussion, three measures were dropped. Six measures suggested by the stakeholders were added to a list of new measures for future consideration.

Phase 6: Post Hoc Analysis and Stratification of the Measures

After the workgroup had completed its decision making, the measures were organized post hoc into four groups based on strength of support for the measures overall across the dimensions of importance and measures quality of care and educational effectiveness. The purpose of the post hoc analysis was to better prioritize measures for future development. The post hoc groupings were made based on the classic definition of agreement or disagreement from the RAM.[13] According to this approach, agreement occurs when approximately 67% of the ratings fall into the same three-point range on a nine-point Likert scale (either 1–3, 4–6, or 7–9) as the median of the ratings. Replicability of results across rating groups is expected when this definition is used.

In this study, a measure was classified as a priority for future development when raters agreed that it is important, measures quality of care, and measures educational effectiveness. Agreement was indicated when at least 67% of the ratings for each of the three dimensions across all raters from the workgroup and external stakeholder groups were in the 7–9 point range on the scale. For the practical purpose of further distinguishing the most strongly supported measures, those measures receiving ratings of 7–9 by at least 75% of raters on all three dimensions were classified into a high agreement group. Measures were included in an "uncertain" group if the agreement criteria was not reached for one or more dimensions and ratings on the other dimensions displayed uncertainty rather than disagreement when the RAND definition was applied. Measures meeting the RAND disagreement definition on one or more dimensions were put into the disagreement group.

Structured Exercise for Exploring the Linkage of Education, Competencies, and Patient Care Quality

After constructing the final version of the preliminary set of measures, the workgroup performed a structured exercise to explore linkages among education, competencies, and patient care quality. Establishment of causal relationships is a necessary step for demonstrating the validity of the measures for assessing educational outcomes. The exercise consisted of selecting a sample of measures and identifying for each of them: 1) specific competencies (knowledge and skills from the six general competency domains) needed to successfully treat the condition or perform the procedure being assessed using the measure, 2) educational activities likely to occur in residency programs to foster development of the competencies, and 3) factors extraneous to the educational program that might intervene to affect patient care and the associated quality-of-care measures.

RESULTS

A set of 62 measures in four categories was identified through the workgroup and external stakeholder ratings and selection process. They included 43 measures for 21 clinical conditions; eight medication measures, including four specific high-priority drug interactions; seven measures for six tasks or procedures; and four measures of department efficiency.

Twenty-six measures met the stricter quantitative criteria for agreement applied post hoc using the RAM. These measures are presented in the high and moderate columns in Table 1 and the Data Supplement under "Agree" (available as an online Data Supplement at http://www.aemj.org/cgi/content/full/j.aem.2006.12.011/DC1). For these measures, a minimum of 67% of raters provided ratings of 7–9 on the scale for each of the dimensions. For the 19 measures in the high agree column, a minimum of 75% of ratings were in the 7–9 point range on the scale. Because the raters agreed that the measures rate highly on the dimensions, these measures can be considered the most appropriate for further development. From 26% to 93% of the workgroup and external stakeholder group members rated the measures between 7 and 9 on the "feasible to measure" dimension. Fourteen of these met the RAM criteria for agreement. These results are presented in Table 1 and the online Data Supplement. Among the measures rated most difficult to measure were the following: for deep vein thrombosis or pulmonary embolism, measuring whether pretest probability was assessed; for headache, percent of subarachnoid hemorrhage diagnosis missed (first 72 hours); and for C-spine, conformance with Canadian C-spine or National Emergency X-Radiography Utilization Study (NEXUS) rules.

All but four of the remaining measures were classified in the uncertain category. These 32 measures received less than 67% of ratings in the 7–9 point range for at least one of the three dimensions. For nine of these, the ratings were below the agreement criteria only for the educational effectiveness dimension. There was disagreement across raters on all four departmental efficiency and effectiveness measures. Six additional measures suggested by members of the external stakeholder groups but not rated during the course of the project were retained for future consideration. These are presented in Table 2.

Documentation supporting use of 15 measures associated with six clinical conditions and one procedure was

Table 1
Summary of Measure Ratings across Critical Dimensions

	Agree	
	High	Moderate
Clinical condition		
Acute myocardial infarction		Percent administered aspirin within 24 hours*
Pneumonia	Appropriate initial antibiotic Percent high risk admitted (Pneumonia Severity Index class 4 or 5)	
Asthma	Percent administered anti-inflammatory drugs (corticosteroids)* Percent administered relievers*	
Abdominal pain	Unscheduled return with ruptured ectopic pregnancy within 72 hours	
Headache		Percent subarachnoid hemorrhage diagnosis missed (first 72 hours)
Syncope/dizzy/shortness of breath		Electrocardiography for patients older than 50 years
Deep vein thrombosis/pulmonary embolism	Percent of patients with deep vein thrombosis/pulmonary embolism receiving anticoagulation in the ED* Pretest probability assessed	
C-spine		Conformance with Canadian C-spine or NEXUS rules
Meningitis	Time to antibiotics in documented meningitis*	
Pregnancy	Rh screening done on threatened abortion and trauma with pregnancy*	
Seizures		Percent head computed tomographic scan for seizure patients (first-time seizure) excluding febrile seizure
Toxicology: unknown ingestion	Acetaminophen level* Pregnancy test if patient is a female of childbearing age* Documentation of suicidality	ASA level*
Pediatrics: fever in an infant younger than 1 month old	Lumbar puncture with cerebrospinal fluid culture and Gram stain* Urinalysis and urine culture* Blood culture* Antibiotics administered in the ED*	
Medication	Medication orders that are contraindicated due to patient allergy	
Procedures		
Intubation	Successful endotracheal intubation*	
Central lines		Complication of central lines
Sedation	Presedation airway assessment in conscious sedation	

A complete version of this table is provided as an online Data Supplement at http://www.aemj.org/cgi/content/full/j.aem.2006.12.011/DC1.
Agree means that at least 67% of raters provided ratings on the measure in the 7–9 point range on the nine-point Likert scale for the importance/relevance, quality of care, and educational effectiveness dimensions. Classification as "high agree" required 75% of ratings in the 7–9 range on the Likert scale for the three dimensions.
NEXUS = National Emergency X-Radiography Utilization Study; ASA = acetylsalicylic acid.
* At least 67% of the ratings for "feasible to measure" were between 7 and 9 on the scale.

located (see Table 3). All measures are derived from expert consensus or scientific studies.[15–21] Six measures for two conditions currently are among the performance measures used in national hospital reporting and quality improvement initiatives, and five more are candidate measures.[15,16] Three measures are included in guidelines developed by the EM community.[19–21] Seven measures in the groups designated as appropriate for further development are supported by this evidence as quality-of-care measures.

A sample of results from the structured exercise designed to explore the linkage of educational activities

and competencies to patient care process measures is presented in Table 4. For each of the measures, competencies from four to six of the general competency domains were identified as the knowledge and skills needed to provide quality patient care. Also, for each measure, numerous factors were identified that could intervene to influence patient care and associated quality-of-care measures. Typically, these factors were related to the system. They included resource (equipment, drug, and staff) availability, protocols and policies, patient mix, ED crowding, and hospital volume. The results illustrate that quality patient care (measured by the indicators identified in this study) could be a result of educational activities and residents' acquisition and performance of essential competencies but that intervening variables will need to be ruled out as causal factors.

Table 2
Additional Measures Recommended for Inclusion

Condition	Measure
Asthma	Percent discharged with inhaled corticosteroids
Extremity injuries	Documentation of distal N/V examination
Productivity	Patients per hour, RVU per patient, RVU per hour
Testicular torsion	Documentation of genitourinary examination
Vital signs abnormalities	Documentation of reassessment or rationale for patient release
Wound repair	Documentation of tetanus status

RVU = relative value unit; N/V = neuro-vascular.

DISCUSSION

A reliable level of agreement among raters was attained for 26 measures that received high ratings on the importance, quality of care, and educational effectiveness dimensions. These results support the conclusion that there are patient care quality measures that are appropriate for assessing the educational effectiveness of GME in EM. As measures of educational effectiveness and patient care quality, they would indicate whether patient care provided by ED residents and faculty involved appropriate diagnostic testing and treatment processes, correct diagnoses, and successfully performed procedures. Ratings for feasibility of measurement for these 26 indicators suggest that many programs should be able to collect these performance data.

Defining quality indicators using the best available evidence is a goal of this and any performance measurement initiative. Some of the indicators identified in this project were derived previously by others following systematic study of the evidence. Even so, not everyone agrees with these measures. Evolution and refinement of these measures are expected as further research is conducted.

It is appropriate in consensus studies to set selection criteria at whatever level best suits the purpose of the study.[11] This study was an initial inquiry into the appropriateness of using patient care quality measures to assess the effectiveness of GME. Relaxed criteria were used initially to enable a broad set of measures to be identified. The application of the stricter criteria post hoc enabled identification of the most strongly supported measures for future development.

The 19 highest rated measures (i.e., those in the high agree category) could be used as the focus of next development steps involving collection and use of these measures in residency programs. Later, the seven other measures in the agree category could be added to make the set of measures more representative of care in the ED.

The measures in this set already being collected for national performance measurement initiatives (i.e., those related to pneumonia and asthma) will require limited, if any, additional development before collection in the ED. Further research and development are needed before use of the other measures. This might include 1) identification of clinical cases that should be excluded from the measures, 2) study of the reliability and validity of the measures, 3) development of data collection instruments, and 4) study of the evidence base. For all measures, it will be important to further investigate effects of contextual variables that are not elements of the educational program and to develop measurement approaches that adjust or control for these intervening variables.

The initial recommended use for the measures, following essential development activities, is for quality measurement and improvement at the residency program level. Program-level patient care process data indicating, for example, that low percentages of patients with asthma were administered relievers, or low percentages of patients with deep vein thrombosis or pulmonary embolism received anticoagulation therapy, or patients suspected of ingesting toxic substances were not tested for acetaminophen, could indicate deficits in local knowledge about current guidelines or standards of care, inadequacies in the transmission of this knowledge to residents, or inadequate supervision. The performance data would be useful in alerting both residents and ED faculty of the gaps and in signaling that changes in both clinical performance and educational processes are needed.

When collected before and after an educational intervention designed to improve care, the measures would provide evidence simultaneously of whether patient care improved and whether the education intervention was effective. Studies in practice settings have shown that providing feedback on patient care performance to providers can contribute to improved care of patients with acute myocardial infarction and pneumonia[22] and that quality-of-care measures (for asthma) are sensitive to pre-post change following interventions that include education of health care providers.[23–25]

Eventually, though, it will be desirable to use the measures to assess the educational effectiveness of GME programs by considering how well residents collectively perform on these measures. This use is consistent with

Table 3
Evidence and Support for Patient Care Quality Measures

Clinical Conditions	Support for Use	
	Used Nationally for Hospital Performance Measurement	Published Literature Review
Acute myocardial infarction		
Percent administered aspirin within 24 hours	CMS, HQA, JCAHO, APU	
Percent administered beta-blockers within 24 hours	CMS, HQA, JCAHO, APU	
Percent administered thrombolytics within half an hour	CMS, HQA, JCAHO	
Percent undergoing percutaneous coronary intervention within 90 minutes	CMS, JCAHO, HQA (120 minutes)	
Pneumonia		Mandell et al.[17]
Appropriate initial antibiotic	CMS, JCAHO, HQA	
Time to antibiotic (percent less than four hours)	CMS, JCAHO, HQA, APU	
Percent high risk admitted (Pneumonia Severity Index class 4 or 5)		
Asthma		Williams et al.[18]
Percent administered anti-inflammatory drugs (corticosteroids)	JCAHO candidate measure	
Percent administered relievers	JCAHO candidate measure	
Percent measured lung function (peak flow, forced expiratory volume in 1 second)		
Percent return within seven days following ED or observational visit (children)	JCAHO candidate measure	
Head injury		Jagoda et al.[19]
CT scan of the head conforming with NEXUS II head CT or Canadian rules		
Pregnancy		Clinical policy[20]
Rh screening performed on threatened abortion and trauma with pregnancy		
Seizures		Practice parameter[21]
Percent undergoing CT scan of the head for seizure patients (first-time seizure) excluding febrile seizure		
Tasks/procedures		
Complication of central lines	JCAHO candidate measure	

CMS = Centers for Medicare & Medicaid Services; HQA = Hospital Quality Alliance; JCAHO = Joint Commission on Accreditation of Healthcare Organizations; APU = Reporting Hospital Quality Data for Annual Payment Update; CT = computed tomography; NEXUS II = National Emergency X-Radiography Utilization Study II.

the aim of GME, to prepare new physicians to provide high-quality patient care, and with the goal of phase 3 of the ACGME's Outcome Project. Measurement strategies that control for patient mix and other system variables are required before high-stakes use of the data or across-program comparisons, however. Furthermore, programs will require assistance putting into place data collection mechanisms.

Using the measures to assess individual resident performance is desirable but presents additional measurement challenges and considerations. In addition to benefits already mentioned, the use of patient care quality measures potentially would result in more precise measures of residents' ability to provide quality care than those currently obtained based on global ratings or focused observations of resident–patient encounters that lack agreed upon performance standards. Second, as illustrated by the results of the structured exercise, the patient care quality measures could serve as indicators that essential competencies have been acquired, integrated, and applied. Last, assessment using the measures will better prepare residents for practice settings where similar measures are or will be used.

Appropriate use of the measures will require thoughtful interpretation of the results because of the mediating variables the workgroup identified. For example, to conclude that high performance on acute myocardial infarction is due to educational effectiveness, the program will need to rule out high levels of external contribution by specialized units. A conclusion of educational

Table 4
Sample Educational Processes, Competencies, and Intervening Variables that Contribute to Patient Care Quality

Condition: Measure	Educational Processes	Resident Competencies	Intervening Variables
Acute myocardial infarction: percent missing diagnosis of acute myocardial infarction (first 72 hours)	Didactic sessions	Information gathering from patient (PC and ICS)	Inadequate number of monitored or observational beds
	Bedside teaching		Triage (or mistriage)
	Analysis of practice patterns	Knowledge of guidelines, indications, and contraindications (MK)	ED protocol
	Patient follow-up	Ability to accurately interpret electrocardiogram (PC and MK)	Practice patterns (regional variations in care regarding whether an electrocardiogram is obtained)
	Independent reading	Decision-making and judgmental bias toward diagnosis of myocardial infarction (PC)	Resource availability (chest pain unit, stress testing, and imaging)
		Ability to recognize atypical presentation (PC and MK)	
		Knowledge of testing limits (MK)	
		Coordination of care in ED and with consultants (ICS and SBP)	
Otitis media: correct antibiotic prescribed	Didactic sessions	Knowledge of local flora (MK)	Equipment availability (otoscope and insuflator)
	Bedside teaching	Diagnostic skill (PC and MK)	Formulary (drug availability)
	Analysis of practice patterns	Skill with insuflator (PC and MK)	Patient mix (socioeconomic status, cultural norms, and relationship to patient preferences)
	Patient follow-up	Knowledge of guidelines (MK)	Patients' likelihood and ability to comply
	Independent reading	Consideration of costs vis-à-vis patient (PC and SBP)	
		Therapeutic relationship (ICS)	
		Counseling/education (PC and ICS)	
		Analysis of practice patterns (PBLI)	
Intubation: successful endotracheal intubation	Didactic sessions	Knowledge of drugs used for rapid sequence induction (MK)	ED protocol (preprinted drug list)
	Bedside teaching		Patient mix (e.g., patients with head and neck cancer, trauma)
	Analysis of practice patterns	Knowledge of difficult airway algorithms (MK)	Resource and staff availability
	Patient follow-up	Recognition of indications and contraindications (PC and MK)	Equipment availability and location
	Independent reading	Prior experience resulting in procedural skill (PC and MK)	Hospital volume (opportunity to practice)
	Simulation (models, animal labs, cadavers)	Team coordination (ICS and SBP)	
Departmental efficiency/ effectiveness: patient length of stay in the ED	Analysis of practice and improvement projects	Knowledge and skills related to practice improvement (PBLI)	ED crowding

Table 4
(Continued)

Condition: Measure	Educational Processes	Resident Competencies	Intervening Variables
	Participation on hospital committees	Ability to work with others to improve care (ICS and SBP)	Resource availability (ED and hospital staffing levels, trauma or other specialized centers, diagnostic test availability, on-call consultant availability, clinic and subspecialists' appointments, hospital equipment)
	Case reviews of outliers (i.e., patients with especially long stays)	Willingness to take on care improvement activities (P)	Patient mix (elders) Diversion policy Hospital flow Hospital financing Community resources availability (home visit nurses, social services, hospice, emergency housing, and beds in shelters)

Bedside teaching: case presentation and resident/attending physician discussion; attending physician confirms residents' observations through patient interview/examination and provides feedback to the resident. Analysis of practice patterns: examination of a sample of cases related to the same symptoms or condition for care processes and outcomes.
Accreditation Council for Graduate Medical Education general competencies: PC = patient care; ICS = interpersonal and communication skills; MK = medical knowledge; SBP = systems-based practice; PBLI = practice-based learning and improvement; P = professionalism.

effectiveness based on high success rates of resident-performed intubations may need to be qualified if residents treat only selected and uncomplicated patients. Obtaining a large enough sample of performance for each resident for each measure and separating team and system effects from individual performance through exclusions or adjustments are the major measurement challenges.[26]

Relying exclusively on patient care quality measures to assess resident competence is not desirable, because not all competencies are assessed using these measures. One example is the extent to which care is patient centered, compassionate, and respectful. Furthermore, observing and assessing individual competencies during the initial learning stages is a more direct way of ascertaining the extent of attainment of individual competencies that comprise good patient care and of identifying additional improvements needed in fundamental skills and knowledge.

Timeliness and efficiency are among the dimensions of quality of care identified by the Institute of Medicine.[1] In this study, measures related to timeliness of care for individual patients received high ratings on quality of care, but measures of departmental efficiency received low ratings. However, all of these were among the measures rated lowest as indicators of educational effectiveness. Factors external to the ED will significantly affect these measures. Nonetheless, it is important to retain these measures for consideration. Failure to utilize these measures could perpetuate "normalized deviance,"[27] whereby residents learn to accept overcrowding, inefficiencies, and care delivered too late to be of optimal benefit to the patient. Instead, demonstrated improvements in these measures could be the basis for special commendation for excellence in systems-based practice, assuming significant resident involvement in or leadership of multidisciplinary improvement initiatives that produce increases in timeliness and efficiency.

LIMITATIONS

The modified Delphi approach used in this study departed from recommendations in two ways. First, the mean rather than the median rating was used as the initial screening criteria. A post hoc examination revealed that use of the mean or median produced comparable decisions. Second, the workgroup did not complete a second round of voting. The external stakeholder group ratings functionally served instead as the second-round vote. A comparison of final results showed no difference in selection decisions based on combined workgroup and external stakeholder ratings versus external stakeholder ratings alone. Last, given the large number of potential patient care quality measures, different measures could be identified in the initial measure nomination phase of future studies. This would not invalidate the current findings, but rather expand the potential measure set.

CONCLUSIONS

Patient care quality measures, when carefully developed and collected, provide direct measures of the desired outcomes of education: provision of high-quality care. Thus, they have the potential to increase the validity of inferences made about the educational effectiveness of

GME. Further activities to develop and test these measures should be undertaken. The measures identified in this article can be used as a starter set for further development, implementation, and study. Implementation of the measures, especially for high-stakes use, will require resolution of significant measurement issues.

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Home
Course Navigation

Modules

Introduction

Printer Friendly Version

Welcome to Educating Physicians for the 21st Century!

Educating Physicians for the 21st Century provides Program Directors and faculty with foundational information on the Outcome Project. This web-based module contains additional links, resources, and practical examples to help you implement the competencies, implement an assessment system, develop an ACGME competency-based curriculum, and develop a program evaluation plan.

Topic areas include:

- Introduction to Competency-Based Resident Education
- Practical Implementation of the Competencies
- Developing an Assessment System
- Developing a Curriculum Plan
- Developing a Program Evaluation Plan

By working through these five modules you will:

- Articulate foundational principles of competency-based resident education
- Develop a curriculum plan for your program
- Develop an assessment system for your program
- Develop a program improvement plan for your program

Navigating this course

NEXT

The ACGME Learning Portfolio

Background

In 2005, under the leadership of then Executive Director and CEO, David C. Leach, MD, the ACGME contemplated the next steps in the evolution of competency-based education and assessment. One idea that surfaced was the development of an electronic, web-based learning portfolio. Not only a portfolio that supported resident learning, but one that also provided program directors with the ability to "connect the dots" between the variety of learning experiences that their programs offered and the developing competence in residents that resulted, based on multi-source feedback and data points captured within the portfolio.

The ACGME was in the unique position to develop such a tool that could be made available to all residents and programs. By taking a leadership role, the ACGME could hopefully avoid the pitfalls that had plagued the electronic medical record, the development of which was largely uncoordinated across the field. Offering a standard tool with the collection of consistent data points (to be determined by each specialty) would allow for national comparative analysis of current graduate medical education practices, and, ultimately, insight into ways in which to make improvement.

The following table briefly summarizes the steps taken to move the portfolio idea forward to a plan for development and execution.

September 2005	ACGME Board authorized initial exploration and development of a portfolio
Spring 2006	Competency-Based Portfolio Advisory Committee (CBPAC) convened to meet 3 times to develop recommendations for moving forward
February 2007	ACGME Board accepts final recommendations of CBPAC contained within their final report (see below)

1. CBPAC Status Report – November 30, 2006 (PDF)
2. CBPAC Participants (PDF)

[back to top]

Alpha, Beta Testing

In August 2007, testing of an early alpha prototype of the portfolio began with innovators from several academic medical centers that had been involved in the development process (along with ACGME leaders and selected staff). Early alpha testing focused on usability, functionality, and reliability of the portfolio. With early successes in each of these areas, additional programs from varied specialties were incrementally added to the alpha testing process, bringing the total number of active users close to twenty.

In June 2008, an ALP User Group was formed to facilitate sharing of ideas and to bring to bear a collective user voice in providing feedback to the ACGME about needed enhancements to the portfolio. Fine-tuning of the alpha software continued through the academic year based on this group's feedback. As preparations for the release of a beta test version of the portfolio progresses (slated for fall 2009), the ACGME is working to build on the lessons learned from the alpha test phase – including the need to optimize the ease of set-up and initialization of the portfolio, as well as the functionality of key modules, such as learning activities and evaluations.

Once the beta test version has been thoroughly vetted by currently enrolled sites and system modifications made, a 'rollout' beta version of the portfolio will be made available to current and new beta enrollees (those that were accepted as part of a previous application process, along with newly interested programs) in early 2010.

[back to top]

The Future – In Support of Milestones

In the May 2008 (PDF) and the September 2008 (PDF) publications of the *ACGME Bulletin*, Thomas J. Nasca, MD, CEO of the ACGME, articulates his vision for the future of GME and the continued advancement of the ACGME's Outcomes-Based Accreditation Project. An integral part of the vision is the creation of milestones of resident competency development. The milestones will define the behavioral attributes that are essential to be demonstrated in each competency domain before a resident graduates and at other key points during the resident's education.

Specialty milestone groups are being convened to develop milestones and identify assessment tools. The milestones, assessment tools, and common curriculum components will be pre-loaded into specialty-specific versions of the portfolio. ALP will serve as the required repository for semi-annual documentation of resident performance against the milestones. ALP will also aggregate the data and produce local and national reports. Such data will support program review and improvement.

[back to top]