CMSS
Council of Medical Specialty Societies

# 2019 Spring Meeting – Friday, May 10
# Marriott Magnificent Mile, Chicago, IL
# CPD Directors Agenda

7:00am Breakfast

7:30am Welcome and CMSS Business Meeting

8:00am Opening Plenary: Employed Physician Trends: Implications for Specialty Societies

9:00-11:45am Component Group Meeting

9:00am Welcome/Introductions
- Component Group leadership
- AAMC Convey/CMSS Disclosure Task Force/Open Payments

9:30am Tom Granatir/ABMS – Vision Commission report and first steps in implementation; Board mission creep into CME

10:00am Dion Richetti/ACCME – Call for Comment on SCS; Data on simulation activities and continued discussion of "Other" activities

10:30am Break

10:45am Sarah Pritchard/AMA – AMA Ed Hub demo

11:15am Listserv and Survey Results: Annual meeting reimbursement policies (Deborah Samuel); Activity format/teaching strategies (Shelby Englert)

11:45am Luncheon Plenary: Achieving Gender Equity in Medicine: Role of Specialty Societies

1:00-2:30pm Component Group Meeting

Surveys of medical students on learning modalities (see attachments, esp. page 4 of the AAMC 2017 survey report)

Show and Tell of Best Practices

Strategic Planning (see attached ACEhp Almanac articles)

2:45pm Component Group Reports

3:15pm Closing Plenary: Open Access and Plan S: Impact on Specialty Society Publishers

# *Continuing Board Certification: Vision for the Future Commission: Implementation Plan*

# About the Commission

- Collaborative effort that brought together multiple stakeholders to envision the future of continuing board certification.
  - Independent body of 27 individuals representing diverse stakeholders
- Commission's charge:
  - Make recommendations regarding principles, frameworks and program models for the continuing board certification system that are
    - responsive to the needs of those who rely on the system
    - relevant, meaningful and of value to those who hold the credential
- The Commission gathered and considered stakeholder input to produce the set of recommendations in the Final Report.
  - Series of meetings February 2018 – January 2019
  - Extensive testimony and comments on the draft report

# Commission Report

- The Commission submitted its final report to the ABMS BOD February 12, 2019.
  - Primary audience: ABMS Board of Directors
  - Secondary audience: ABMS and Stakeholder Communities
- ABMS and Member Boards thank the Commission for their commitment to advancing continuing certification
- Commission recommendations were considered during the ABMS Board of Directors meeting on February 24-27, 2019
  - Multifaceted, collaborative implementation plan

# Themes

- Need to bring value to physicians to support their learning and improvement needs
- Need to bring value to the profession (and other stakeholders) by offering a meaningful credential
  - The two value propositions are not mutually exclusive
- Meaningful self-regulation requires a system of engaged stakeholders – the solution is a collaborative one
- Advancing continuing certification must be accomplished within the profession

# Timeline

- Recommendations were prioritized into three stages:
  - Foundational Recommendation (1)
  - Short-term and Intermediate Recommendations (10)
  - Aspirational Recommendations (3)

# Foundational Recommendation

Continuing certification must integrate professionalism, assessment, lifelong learning and advancing practice to determine the continuing certification status of a diplomate.

- What it means
  - Move from siloed 4-part framework
  - Assessment, learning and improvement activities must be integrated
    - Programmatically
    - Into physician practices
- Implementation Actions
  - **ABMS commitment to implement new/revised standards by 2020**
  - Standards will address:
    - Flexibility in knowledge assessment and advancing practice
    - Feedback to diplomates
    - Consistency

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# Short-Term and Intermediate Recommendations

# Assessment Recommendation

Continuing certification must change to incorporate longitudinal and other innovative formative assessment strategies that support learning, identify knowledge and skills gaps, and help diplomates stay current. The ABMS Boards must offer an alternative to burdensome highly-secure, point-in-time examinations of knowledge.

- What it means
  - Diplomates must have alternatives to point-in-time exams for knowledge assessment
  - Assessment should support learning and improvement
- Implementation Actions
  - **All 24 Member Boards have agreed to**
    - **commit to longitudinal or other formative assessment strategies**
    - **pursue alternatives to the highly-secure, point-in-time examinations of knowledge**
  - Revised standards include flexibility for diplomates

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# Recommendation on Certification Status

The ABMS Boards must change a diplomate's certification status when continuing certification standards are not met.

- What it means
  - Boards must make consequential decisions when continuing certification standards are not met
  - Consequences other than P/F should be defined
- Implementation Actions
  - Include in new standards definitions of certification statuses and designations
  - Define the portfolio of elements that contribute to a consequential decision

# Remediation Pathways Recommendation

The ABMS Boards must have clearly defined remediation pathways to enable diplomates to meet continuing certification standards in advance of and following any loss of certification.

- What it means
  - Consequences short of certificate revocation require opportunities for learning and improvement
  - External stakeholders (professional and state societies, CME providers) are key partners in implementing remediation pathways
- Implementation Actions
  - Create a Task Force on Remediation Pathways that includes external stakeholders

# Recommendation on Consistent Processes and Requirements

The ABMS and the ABMS Boards must have consistent processes and requirements for continuing certification that are fair, equitable, transparent, effective and efficient.

- What it means
  - Eliminate inconsistency that is not practice relevant
  - Processes, such as cycle length, must be consistent
  - Transparency and fairness are essential; also, keeping costs down
- Implementation Actions
  - Move all ABMS Boards to a uniform cycle length
  - Prioritize processes for review
  - Develop strategies to reduce inconsistency and enhance transparency

# Recommendation for Diplomates who are Multi-Specialty

The ABMS Boards must enable multi-specialty and subspecialty diplomates to remain certified across multiple ABMS Boards without duplication of effort.

- What it means
  - Reduce redundancy for diplomates with multiple certificates
  - Need consistent policy across Boards regarding requirements for maintaining the primary certificate
- Implementation Actions
  - Develop reciprocity agreements between Boards for program components
  - Develop and implement a model policy about maintaining the primary certificate for those diplomates who practice in their subspecialty

# Diplomate Communication Recommendation

The ABMS Boards must regularly communicate with their diplomates about the standards for the specialty and encourage feedback about the program.

- What it means
  - Bidirectional communication and diplomate engagement is important
    - Keep diplomates informed
    - Seek and integrate diplomate feedback
- Implementation Actions
  - Define best practices: assess and make recommendations on changes to ABMS Boards' diplomate engagement strategies
  - Include feedback standards in the revised standards

# Recommendation on Encouraging All Diplomates to Participate

ABMS and the ABMS Boards must make publicly available the certification history of all diplomates, including their participation in the continuing certification process.

ABMS Boards must facilitate voluntary re-engagement into the continuing certification process for lifetime certificate holders and others not currently participating in the continuing certification process.

- What it means
  - Initial and Continuing Certification status should be publicly available
  - Boards should develop strategies for encouraging engagement of non-time limited certificate holders
- Implementation Actions
  - Ensure that public site displays initial certification date and participation in continuing certification
  - Create and implement "low-risk" pathways for non-time limited certificate holders to engage in Continuing Certification

# Recommendation on Compliance with Standards

The ABMS Boards must comply with all ABMS certification and organizational standards, including financial stewardship and ensuring that diverse groups of practicing physicians and the public voice are represented.

- What it means
  - ABMS and Member Boards must ensure practicing physician and the public voice in governance
  - ABMS and Member Boards must be more transparent about finances and how program fees are derived
- Implementation Actions
  - Review standards related to governance and financial stewardship to ensure they meet the Commission's expectations

# Recommendation on Use of the Credential

ABMS must demonstrate and communicate that continuing certification has value, meaning and purpose in the health care environment.

- Hospitals, health systems, payers and other health care organizations can independently decide what factors are used in credentialing and privileging decisions.
- ABMS must inform these organizations that continuing certification should not be the only criterion used in these decisions and these organizations should use a wide portfolio of criteria in these decisions.
- ABMS must encourage hospitals, health systems, payers and other health care organizations to not deny credentialing or privileging to a physician solely on the basis of certification status.

- What it means
  - ABMS should not dictate to stakeholders how they should make privileging and other decisions but provide education about our policy on the use of our certificate
- Implementation Actions
  - Communicate ABMS policy to institutions using our certificate
  - Create and implement a strategy to educate hospitals about the use of the credential and other criteria

# Recommendation on Independent Research

ABMS and the ABMS Boards must facilitate and encourage independent research to build on the existing evidence base about the value of continuing certification.

- What it means
  - ABMS and the Boards should support external and collaborative research on the effectiveness of Continuing Certification programs
  - Internal research should focus on program improvement:
    - Should include experience, engagement and wellness
- Implementation Actions
  - Develop strategies for funding external / collaborative research and data sharing
  - Provide educational sessions on program quality improvement

# Aspirational Recommendations

# Professionalism Recommendation

ABMS and the ABMS Boards must seek input from other stakeholder organizations to develop consistent approaches to evaluate professionalism and professional standing while ensuring due process for the diplomate when questions of professionalism arise.

- What it means
  - Need methods to better evaluate professionalism in the future; development of methods should be collaborative
  - Need to maintain standards for professional standing, but be more consistent about licensure actions
- Implementation Actions
  - Create a multi-stakeholder Task Force on Professionalism
  - Maintain professional standing and licensure standards
  - Continue work with FSMB and Member Boards regarding consistency in licensure actions

# Advancing Practice Recommendation

ABMS and the ABMS Boards should collaborate with specialty societies, the CME/CPD community and other expert stakeholders to develop the infrastructure to support learning activities that produce data-driven advances in clinical practice.

ABMS Boards must ensure that their continuing certification programs recognize and document participation in a wide range of quality assessment activities in which diplomates already engage.

- What it means
  - Need to work with stakeholders to address operational, methodological and system-related impediments to participation in meaningful QI/PI
  - Need to maintain "wide door" approach to approving existing QI/PI participation
- Implementation Actions
  - Create a multi-stakeholder Task Force on Advancing Practice
  - Revised standards must credit a range of QI/PI activities

# Recommendation on Collaboration and Data Sharing

The ABMS Boards must collaborate with professional and/or CME/CPD organizations to share data and information to guide and support diplomate engagement in continuing certification.

- What it means
  - Our professional self-regulatory system consists of multiple partners: ABMS, Member Boards, Professional and State Societies, CME providers, and health care institutions
  - Effective self-regulation requires collaboration and sharing of data and information
- Implementation Actions
  - Hold a Summit on collaboration with key stakeholders
  - Build on existing engagement plan for the specialty societies, state medical societies and other stakeholders that includes regular meetings, communications and presentations

# Implementation Plan

# ABMS Response

- ABMS supports the Commission recommendations
- ABMS believes the report supports alternative assessment programs and other improvements to MOC
- ABMS believes the Commission recommendations have two main points:
  - MOC has to deliver recognizable value to participating physicians
  - MOC has to yield a meaningful certificate for both physicians and users of the certificate (hospitals, public, etc.)

# Implementation Plan

- Establish the "Achieving the Vision for Continuing Board Certification" Oversight Committee to direct the implementation strategy
  - Committee will seek guidance from the ABMS' new Stakeholder Council and other stakeholders
- Staged similar to Commission recommendations (short term, intermediate, aspirational)
- Collaborative Task Forces*
  - Remediation pathways
  - Assessment of professionalism
  - Quality improvement/Advancing Practice
  - Data and information sharing

** Task forces will include representatives of state and specialty societies, other stakeholders*

# QUESTIONS?

# The AMA Ed Hub™

*The Answer to Lifelong Learning, Licensure and Certification Needs*

Founded in 1847, the mission of the American Medical Association is to promote the art and science of medicine and the betterment of public health. Since its inception, the AMA has been committed to lifelong learning that helps physicians and other health care providers achieve real world outcomes of better health and better health care.

The AMA Ed Hub™ is a new health education network, bringing together high-quality content from trusted sources on clinical and professional healthcare topics, personalizing recommendations, and automating credit tracking and reporting.

### Streamlined access to educational activities from trusted sources—in one place

- JN Learning™ audio and article-based CME activities from the JAMA Network™
- AMA STEPS Forward™: A series of courses and case studies focused on approaches to help optimize practice efficiency, enhance patient care while increasing physician satisfaction and decrease physician burnout
- AMA signature courses on topics such as: ethics, law, lifestyle, and other relevant healthcare professional topics
- Unique educational courses curated and provided in collaboration with leading societies across healthcare

### Easily discoverable learning activities

- Intuitive learning experiences accessible on any device in formats ranging from traditional online courses and journal articles to new audio and video multimedia experiences

### Personalized learning

- Automatic recommendations based on an individual learner's interests, state of licensure, and past online activities

### Consolidated transcripts of CME/MOC activities

- Automatic CME reporting for clinicians practicing Tennessee and North Carolina
- Automatic MOC reporting specialists licensed by the American Board of Internal Medicine and American Board of Pediatrics

## *A Flexible Platform Offering Varied Partnership Opportunities*

The AMA Ed Hub provides a powerful solution for content providers to promote and distribute their education, offering increased discoverability and engagement with their education and an opportunity to expand reach beyond their traditional audiences. The AMA Ed Hub leverages a flexible platform enabling different levels of content partnership opportunities and several state-of-the-art functionalities.

### CONTENT INTEGRATION OPTIONS

| | |
|---|---|
| **CONTENT HOSTING** | Original educational content developed by a content provider is hosted on the AMA Ed Hub platform<br>⇒ *Benefit: Content is easily discoverable within the AMA Ed Hub experience to make it easy for learners from all specialties to find the courses most relevant to their needs.*<br><br>Educational activities are tagged by topic and included in the global set of content available on the AMA Ed Hub<br>⇒ *Benefit: Tagged activities match to learner interests and appear within search results, email alerts and widgets.* |
| **CONTENT PROMOTION PAGES** | Content providers may choose to keep original content hosted on their platform. The content is indexed, tagged by topic, and state CME requirements within the AMA Ed Hub.<br>⇒ *Benefit: Enhanced reach and discoverability: learners from across specialties can find the activity on both the content partner site and on the AMA Ed Hub through Google, on-site search, and personalized email alerts.*<br><br>The content is matched to AMA Ed Hub user's interests and state of licensure within AMA Ed Hub content areas, topical index, search results, and email alerts.<br>⇒ *Benefit:* Learners discover and preview the activities on the AMA Ed Hub before linking to the content provider's site to complete the activity. |

AMA Ed Hub™

# AMA ED HUB SITE FUNCTIONALITIES

| | |
|---|---|
| **CUSTOM BRANDED PRODUCT SITE WITHIN THE AMA ED HUB** | Content partners launch and brand their own sites and content within the overarching AMA Ed Hub.<br>⇒ *Benefit:* Partner brands and content shine while the AMA Ed Hub maintains consistent navigation and user experience for the learner. |
| **CONTENT DEVELOPMENT** | A team of experienced learning designers are available to assist with content authoring, copyediting, proofreading, composition, and tagging to ensures content is engaging, relevant and CME-compliant.<br>⇒ *Benefit:* Optimized content for online discoverability, usability, and compliance with educational standards of development. |
| **TRANSCRIPT TRACKING** | The AMA Ed Hub Reports provides global tracking of course completion for all users. Users completing activities on the AMA Ed Hub or on the content partners' site will see a unified transcript within the AMA Ed Hub account. The AMA Ed Hub supports tracking a variety of accredited certificates, including CME, CEU, CE, and more.<br>⇒ *Benefit:* Eliminate learners' need to manual track hundreds of credit records |
| **AMA ED HUB™ REPORTS** | The AMA Ed Hub Reports enables automatic transfer of transcripts information to be directly sent to state and specialty medical boards to award credit to learners. We are currently supporting automatic credit transfer for MOC to the American Board of Internal Medicine and the American Board of Pediatrics, and CME to the North Carolina and Tennessee state medical boards. Additional expansions are planned to optimize coverage of state and specialty boards.<br>⇒ *Benefit:* Eliminate learners' need to manually report to state and specialty boards. |
| **CONTENT MARKETING** | Content within the AMA Ed Hub is promoted via email campaigns and e-alerts designed to drive personalized awareness and engagement of new learning opportunities.<br>⇒ *Benefit:* Increase reach, awareness, and targeted engagement. |
| **ANALYTICS AND PERFORMANCE REPORTS** | A custom dashboard is generated for each content provider outlining web analytics, email, and other key traffic performance metrics. Content providers will also receive monthly usage and credit tracking reports.<br>⇒ *Benefit:* Ongoing monitoring of content performance and usage trends. |

| | |
|---|---|
| **CONTENT INDEXING AND EMAIL PROMOTION BY STATE CME REQUIREMENTS** | All content certified for CME is indexed by state CME requirements<br>⇒ *Benefit:* Learners easily discover activities to meet their state of licensure's topical continuing education requirements. |

## *The AMA shares its expertise to pursue a common goal: better health care*

- Publishing high-value medical content since 1883
- Developing medical education content from AMA, JAMA Network, and Steps Forward
- Aligning multimedia and adult learning best practices with CME to revitalize physician enthusiasm in medical education
- Creating scalable, mobile-friendly, and SEO-friendly digital web sites and apps
- Expertise in product development, instructional design, and user experience design
- Strong brand equity with AMA and JAMA Network within the physician and healthcare

The AMA Ed Hub will continue to grow and add activities from trusted content sources as we strive to deliver impactful, innovative education that helps physicians improve care.

*To learn more about content partnership opportunities, contact amaedhubcontentpartners@ama-assn.org.*


# Medical School Year Two Questionnaire

## 2017 All Schools Summary Report

March 2018

Association of
American Medical Colleges

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**2017 AAMC Medical School Year Two Questionnaire**
**All Schools Summary Report & Individual School Report**

## Executive Summary

### Background

The Association of American Medical Colleges (AAMC) developed the Medical School Year Two Questionnaire (Y2Q) as a means for the AAMC, medical schools, and other organizations to identify and address issues critical to the future of medical education and the well-being of medical students. These issues include satisfaction with medical education, career and specialty plans, and perceptions of the medical school learning environment. The Y2Q can be used by medical schools, faculty, students, and researchers for benchmarking purposes and for improving medical education programs.

The *All Schools Summary Report* includes national data from the 2015, 2016, and 2017 Y2Qs for comparison purposes, where comparison data are available. Copies of the *All Schools Summary Report* and the survey instrument are publicly available on the AAMC website at www.aamc.org/data/y2q. In addition to the *All Schools Summary Report*, each medical school is issued a school report displaying data for the school alongside the national data. By request, regional campuses and programs offering specialized medical training under the aegis of an accredited institution are also issued campus reports if the campus or program had five or more respondents. Campus reports display data for the campus alongside data for the parent institution (with combined data for all campuses). School and campus reports are made available to schools' authorized AAMC Student Surveys contacts.

### Methodology

The 2017 Y2Q *All Schools Summary Report* provides aggregate data from active second-year students at U.S. medical education programs accredited by the Liaison Committee on Medical Education (LCME). The 2017 Y2Q was open from October 1, 2017 to January 3, 2018. Initial participants were identified by the AAMC Student Records System (SRS). While the survey was open, medical schools could request changes to the list of eligible participants to reflect changes in second-year status.

The data in the 2017 Y2Q *All Schools Summary Report* reflect the responses of 13,467 individuals from the 145 medical schools with second-year students in the 2017-2018 academic year. This represents a 63.5% response rate of the 21,193 individuals identified by SRS as active second-year students at the time the survey closed. Survey data for participating individuals may not be comparable to data for nonparticipants.

The AAMC sent email invitations and reminders to students using email addresses on record in SRS. Due to the impact of hurricanes in 2017, the AAMC did not sent invitations to students at one medical school; the total number of schools with participants in the 2017 Y2Q was thus 144. The response rates varied among the participating medical schools. There were 15 medical schools with a response rate of 90% or above; 16 medical schools with response rates between 80% and 89%; 30 medical schools with response rates between 70% and 79%; 27 medical schools with response rates between 60% and 69%; 19 medical schools with response rates between 50% and 59%; 21 schools with response rates between 40% and 49%; and 16 medical schools with response rates below 40%. The median response rate across participating schools was 66.3%.

The Y2Q included questions regarding the lifestyles, personal characteristics, and learning environments of second-year medical students. Established research scales were included to assess tolerance for ambiguity, empathy, quality of life, perceived stress, perceptions of the learning environment, and burnout. Descriptions of each scale and scoring conventions are provided within the report. Where applicable, a reliability estimate (Cronbach's alpha) is also provided as a measure of internal consistency. A reference list of articles describing these scales is provided at the end of this report.

Percentages displayed in the report may not sum to 100 due to rounding or to questions permitting more than one response. All percentages are rounded. As a result, a percentage of "0.0" does not necessarily indicate that no students responded to that survey option.

**Y2Q Content and Report Modifications**

The 2017 Y2Q discontinued one question that had been on previous surveys: “Please tell us your estimate of the current average salary for the specialty you selected.” This question had been reported as item number 24 in the 2016 Y2Q reports. As a consequence, for items 24 and following, the content in the 2017 reports has different numbering than the corresponding content in the 2016 reports.

For the 2017 Y2Q reports, the display of responses for item 29 have been modified. This item shows the results to the question, “In thinking about a typical week during your pre-clerkship education, please provide the average number of hours per day that you spent doing the following activities” including sleeping, exercising, and working for pay. In previous years, the mean number of hours and standard deviation had been reported for each specified activity. The 2017 reports now display the median number of hours spent doing each activity along with additional time-amount categories that more fully represent the distribution of responses.

**Selected Findings**

*Second-Year Medical Students Report Satisfaction with Their Medical School Education.*

More than eight in ten second-year medical students in 2017 reported being satisfied with the quality of their medical education (85.1%). This includes 57.1% who responded “Agree” and 28.0% who responded “Strongly agree” to the statement, “Overall, I am satisfied with the quality of my medical education.”

*In-Person Class Attendance Continues to Decline as Virtual Class Attendance Rises.*

Compared to previous classes, second-year medical students in 2017 were less likely to report attending in-person classes for pre-clerkship courses or lectures. Fewer than half (47.3%) reported having attended in-person pre-clerkship courses or lectures at their medical school “Most of the time” (34.7%) or “Often” (12.6%). This continues a decline observed in prior years: in 2016, the figure was 50.6% and in 2015 it was 52.3%. Nearly a quarter (23.5%) of second-year students in 2017 reported “Almost never” attending in-person courses or lectures. This is an increase of more than five points over what was reported in 2015 (18.2%).

Second-year medical students in 2017 were more likely than their predecessors to report participating in virtual pre-clerkship courses and lectures. The share of second-year medical students who said they attended virtual courses “Most of the time” or “Often” grew to 58.0%. In 2015 the share was 52.6%.

Second-year students’ reported use of online videos for their medical education information has also grown in recent years. In 2017, about one in four students (24.2%) reported using online videos on a daily basis. In 2015, the figure reported was 13.4%, or fewer than one in seven students. In 2014, this figure was fewer than one in ten students: 9.1%.

*Student Awareness of Mistreatment Policies and Procedures Continues to Increase.*

Nearly nine in ten (89.8%) second-year medical students in 2017 reported that they are aware that their school has policies regarding the mistreatment of medical students. The percentage of students reporting awareness of these policies has increased about two points per year in recent years (2016: 88.0%; 2015: 86.0%). Additionally, 68.6% of second-year medical students reported knowing the procedures at their medical school for reporting mistreatment. This also represents an increase compared to what was reported by previous classes (2016: 63.8%; 2015: 61.6%).

*Medical Schools Provide Increasingly Effective Tools for Bias Detection.*

Second-year medical students in 2017 were more likely than their predecessors to report that, at their medical school, “Students learn effective tools for recognizing their own bias in interacting with people of different identity groups.” Students who indicated they “Agree” or “Strongly agree” with this statement were 67.2% of respondents in 2017. By comparison, in 2016 they were 64.4% and in 2015 they were 62.5%. The percentage responding “Strongly agree” was 18.7 percent in 2017 compared to 14.9% in 2015.

*Most Students Sleep Seven Hours or More Each Day.*

The median daily amount of sleep reported by second-year medical students in 2017 was seven hours. Nearly a third of all respondents (32.5%) said they get eight or more hours of sleep each day. About one in eleven students (9.2%) reported doing paid work while also being in medical school. For those students who did report doing paid work, about half of them (4.3%) said they worked between one to two hours each day.

*Second-Year Medical Students Self-Report Their Marital Status, Sexual Orientation, and Gender Identity.*

About one in eight second-year medical students in 2017 said they were married (12.4%) or in a common law or civil union (0.4%) relationship. Those with dependents other than a spouse totaled 3.7% of respondents. Respondents most frequently self-identified as heterosexual or straight (92.1%), with 4.1% identifying as gay or lesbian and 3.8% as bisexual. Those who identified as having a gender identity that differed from the sex they had been assigned at birth were 0.6% of all respondents.

**Providing Feedback**

We encourage constituents to provide feedback regarding the Y2Q reports. If you would like to provide feedback, please contact Y2Q@aamc.org, or David Matthew, Senior Research and Data Analyst, Data Operations and Services (dmatthew@aamc.org).

| | All Schools | | |
|---|---|---|---|
| | **2015** | **2016** | **2017** |
| **Total number of students who responded to the questionnaire:** | 11,586 | 12,457 | 13,467 |

**1. Gender:**
**Note: This information is populated from other AAMC data sources (e.g., SRS).**

| | Percent | Percent | Percent |
|---|---|---|---|
| Male | 49.2 | 49.0 | 47.3 |
| Female | 50.8 | 51.0 | 52.7 |
| Number of respondents | 11,586 | 12,455 | 13,465 |

**2. Age during second-year:**
**Note: This information is populated from other AAMC data sources (e.g., SRS).**

| | Percent | Percent | Percent |
|---|---|---|---|
| Under 21 | 0.2 | 0.1 | 0.2 |
| 21 through 23 | 36.9 | 36.6 | 37.3 |
| 24 through 26 | 44.3 | 45.5 | 45.9 |
| 27 through 29 | 12.1 | 11.6 | 10.8 |
| Over 29 | 6.6 | 6.1 | 5.7 |
| Number of respondents | 11,586 | 12,457 | 13,467 |
| Median age at second-year | 24 | 24 | 24 |

**3. How do you self-identify?**
**Note: Percentages may not sum to 100% as multiple responses are allowed. This information is populated from other AAMC data sources (e.g., SRS).**

| | Percent | Percent | Percent |
|---|---|---|---|
| American Indian or Alaska Native | 1.0 | 0.8 | 1.0 |
| Asian | 20.1 | 22.0 | 22.8 |
| Black or African American | 6.9 | 7.0 | 7.7 |
| Hispanic, Latino, or of Spanish origin | 8.7 | 8.8 | 8.9 |
| Native Hawaiian or Other Pacific Islander | 0.3 | 0.4 | 0.3 |
| White | 65.4 | 63.4 | 64.2 |
| Other | 3.5 | 3.5 | 3.3 |
| Non-U.S. citizen and Non-permanent resident | 1.7 | 1.8 | 1.3 |
| Number of respondents | 10,884 | 11,895 | 13,237 |

**4. What is your current marital status?**

| | Percent | Percent | Percent |
|---|---|---|---|
| Single (never legally married) | 85.2 | 86.0 | 86.5 |
| Legally married | 13.4 | 12.8 | 12.4 |
| Common law or civil union | 0.5 | 0.3 | 0.4 |
| Divorced | 0.6 | 0.7 | 0.4 |
| Separated, but still legally married | 0.2 | 0.2 | 0.2 |
| Widowed | 0.0 | 0.0 | 0.0 |
| Number of respondents | 10,481 | 11,370 | 12,286 |

**5. How many dependents do you have (not including a spouse/partner)?**

| | All Schools | | |
|---|---|---|---|
| | 2015 | 2016 | 2017 |
| | Percent | Percent | Percent |
| None | 95.5 | 95.8 | 96.3 |
| One | 2.7 | 2.3 | 2.2 |
| Two | 1.2 | 1.2 | 1.0 |
| Three | 0.4 | 0.4 | 0.3 |
| Four or more | 0.2 | 0.2 | 0.1 |
| Number of respondents | 10,483 | 11,371 | 12,290 |

**6. Please indicate the extent to which you agree with the following statement:**

| | | Percentage of Respondents Selecting Each Rating | | | | | |
|---|---|---|---|---|---|---|---|
| | | Strongly disagree | Disagree | Neutral | Agree | Strongly agree | Count |
| Overall, I am satisfied with the quality of my medical education | | | | | | | |
| All Medical Schools | 2017 | 1.0 | 4.6 | 9.3 | 57.1 | 28.0 | 13,460 |
| All Medical Schools | 2016 | 1.1 | 4.2 | 9.4 | 55.0 | 30.4 | 12,450 |
| All Medical Schools | 2015 | 1.3 | 4.2 | 9.1 | 56.4 | 29.1 | 11,583 |

**7. Please describe how often you attend:**

| | | Percentage of Respondents Selecting Each Rating | | | | | |
|---|---|---|---|---|---|---|---|
| | | Almost never | Occasionally | Somewhat often | Often | Most of the time | Count |
| In-person pre-clerkship courses/lectures at YOUR medical school | | | | | | | |
| All Medical Schools | 2017 | 23.5 | 17.4 | 11.8 | 12.6 | 34.7 | 13,234 |
| All Medical Schools | 2016 | 20.3 | 17.2 | 11.9 | 14.1 | 36.5 | 12,236 |
| All Medical Schools | 2015 | 18.2 | 16.7 | 12.9 | 14.7 | 37.6 | 11,318 |
| Virtual pre-clerkship courses/lectures (e.g., podcast or video) at YOUR medical school | | | | | | | |
| All Medical Schools | 2017 | 17.0 | 14.0 | 11.0 | 15.6 | 42.4 | 13,128 |
| All Medical Schools | 2016 | 17.5 | 14.3 | 10.9 | 15.7 | 41.6 | 12,142 |
| All Medical Schools | 2015 | 20.3 | 15.9 | 11.3 | 15.8 | 36.7 | 11,202 |

**8. Please describe how often you utilize the following online resources:**

| | | Percentage of Respondents Selecting Each Rating | | | | | |
|---|---|---|---|---|---|---|---|
| | | Never | Less than once a month | At least once a month | At least once a week | Daily | Count |
| Online medical education courses/lectures from OTHER medical schools | | | | | | | |
| All Medical Schools | 2017 | 42.4 | 27.2 | 13.4 | 10.6 | 6.4 | 13,257 |
| All Medical Schools | 2016 | 40.2 | 29.8 | 14.3 | 10.8 | 4.9 | 12,254 |
| All Medical Schools | 2015 | 37.5 | 29.5 | 16.9 | 11.7 | 4.4 | 11,344 |
| Online videos for medical education information (e.g., YouTube) | | | | | | | |
| All Medical Schools | 2017 | 3.6 | 13.5 | 21.8 | 36.9 | 24.2 | 13,265 |
| All Medical Schools | 2016 | 4.5 | 17.2 | 26.3 | 35.8 | 16.2 | 12,263 |
| All Medical Schools | 2015 | 4.6 | 18.4 | 29.4 | 34.3 | 13.4 | 11,328 |

**8. Please describe how often you utilize the following online resources: (Continued)**

| | | Percentage of Respondents Selecting Each Rating | | | | | |
|---|---|---|---|---|---|---|---|
| | | Never | Less than once a month | At least once a month | At least once a week | Daily | Count |
| Other online content for medical education information (e.g., Wikipedia) | | | | | | | |
| All Medical Schools | 2017 | 1.7 | 5.2 | 10.7 | 37.7 | 44.7 | 13,188 |
| All Medical Schools | 2016 | 1.3 | 4.3 | 11.0 | 39.3 | 44.1 | 12,221 |
| All Medical Schools | 2015 | 1.1 | 3.2 | 10.0 | 36.0 | 49.7 | 11,312 |

| | All Schools | | |
|---|---|---|---|
| | 2015 | 2016 | 2017 |
| **9. When did you take, or when do you expect to take, the USMLE Step 1 exam?** | Percent | Percent | Percent |
| I have already taken Step 1 | 0.2 | 0.2 | 0.2 |
| I will take Step 1 before the end of the current calendar year | 0.8 | 1.1 | 0.8 |
| I will take Step 1 sometime from January to March of next year | 14.4 | 16.0 | 18.6 |
| I will take Step 1 sometime after March of next year | 84.6 | 82.7 | 80.4 |
| Number of respondents | 11,356 | 12,272 | 13,281 |
| **10. Are you aware that your school has policies regarding the mistreatment of medical students?** | Percent | Percent | Percent |
| Yes | 86.0 | 88.0 | 89.8 |
| No | 14.0 | 12.0 | 10.2 |
| Number of respondents | 11,351 | 12,270 | 13,275 |
| **11. Do you know the procedures at your school for reporting the mistreatment of medical students?** | Percent | Percent | Percent |
| Yes | 61.6 | 63.8 | 68.6 |
| No | 38.4 | 36.2 | 31.4 |
| Number of respondents | 11,356 | 12,273 | 13,281 |

**12. Please indicate the extent to which you agree with the following statements about your medical school:**

| | | Percentage of Respondents Selecting Each Rating | | | | | |
|---|---|---|---|---|---|---|---|
| | | Strongly disagree | Disagree | Neutral | Agree | Strongly agree | Count |
| My medical school prepares students to effectively communicate with people across a broad spectrum of backgrounds | | | | | | | |
| All Medical Schools | 2017 | 0.7 | 2.7 | 8.2 | 46.9 | 41.4 | 13,152 |
| All Medical Schools | 2016 | 0.7 | 2.8 | 9.0 | 46.3 | 41.3 | 12,151 |
| All Medical Schools | 2015 | 0.8 | 3.3 | 10.4 | 48.2 | 37.3 | 11,218 |
| I often feel isolated at school | | | | | | | |
| All Medical Schools | 2017 | 28.7 | 41.1 | 15.3 | 11.5 | 3.4 | 13,080 |
| All Medical Schools | 2016 | 29.3 | 41.1 | 14.8 | 11.4 | 3.4 | 12,109 |
| All Medical Schools | 2015 | 28.6 | 42.0 | 15.1 | 10.9 | 3.4 | 11,188 |

**12. Please indicate the extent to which you agree with the following statements about your medical school: (Continued)**

| | | Percentage of Respondents Selecting Each Rating | | | | | |
|---|---|---|---|---|---|---|---|
| | | Strongly disagree | Disagree | Neutral | Agree | Strongly agree | Count |
| My teachers and mentors have told me that they have high standards for my performance | | | | | | | |
| All Medical Schools | 2017 | 1.5 | 8.3 | 28.6 | 46.1 | 15.5 | 13,078 |
| All Medical Schools | 2016 | 1.5 | 8.1 | 28.7 | 45.9 | 15.8 | 12,062 |
| All Medical Schools | 2015 | 1.3 | 7.1 | 27.2 | 47.1 | 17.3 | 11,177 |
| I often feel that my performance is being judged more closely than others | | | | | | | |
| All Medical Schools | 2017 | 29.2 | 47.6 | 15.1 | 6.2 | 1.9 | 13,125 |
| All Medical Schools | 2016 | 29.8 | 47.4 | 14.7 | 6.3 | 1.9 | 12,138 |
| All Medical Schools | 2015 | 27.4 | 47.8 | 16.5 | 6.2 | 2.1 | 11,200 |
| My teachers and mentors have told me that they feel sure that I can perform well against high standards | | | | | | | |
| All Medical Schools | 2017 | 1.9 | 9.3 | 27.6 | 43.5 | 17.6 | 13,123 |
| All Medical Schools | 2016 | 2.2 | 8.8 | 28.6 | 42.7 | 17.7 | 12,116 |
| All Medical Schools | 2015 | 2.3 | 8.5 | 28.3 | 43.2 | 17.7 | 11,188 |
| I closely share the professional values and interests of most of my classmates | | | | | | | |
| All Medical Schools | 2017 | 1.5 | 7.0 | 18.9 | 55.8 | 16.8 | 13,062 |
| All Medical Schools | 2016 | 1.4 | 7.1 | 19.3 | 55.5 | 16.7 | 12,074 |
| All Medical Schools | 2015 | 1.5 | 7.4 | 19.6 | 55.4 | 16.1 | 11,155 |
| I often feel as if my performance is being judged as a member of the identity group that I belong to more than as an individual | | | | | | | |
| All Medical Schools | 2017 | 30.9 | 35.8 | 18.4 | 11.2 | 3.7 | 13,107 |
| All Medical Schools | 2016 | 31.2 | 35.4 | 19.1 | 11.3 | 3.1 | 12,110 |
| All Medical Schools | 2015 | 28.7 | 34.0 | 21.4 | 12.5 | 3.5 | 11,178 |
| Students learn effective tools for recognizing their own bias in interacting with people of different identity groups | | | | | | | |
| All Medical Schools | 2017 | 2.6 | 9.1 | 21.1 | 48.5 | 18.7 | 13,071 |
| All Medical Schools | 2016 | 2.7 | 10.0 | 22.9 | 47.4 | 17.0 | 12,077 |
| All Medical Schools | 2015 | 3.0 | 10.3 | 24.2 | 47.6 | 14.9 | 11,159 |
| The medical school experience, to this point, contributes to students' ability to work in disadvantaged communities | | | | | | | |
| All Medical Schools | 2017 | 2.1 | 8.3 | 19.5 | 47.7 | 22.4 | 13,136 |
| All Medical Schools | 2016 | 2.4 | 8.9 | 20.4 | 46.9 | 21.4 | 12,128 |
| All Medical Schools | 2015 | 2.8 | 9.5 | 22.6 | 45.2 | 19.9 | 11,194 |

## 13. Learning Environment Scales

A shortened version of the Medical School Learning Environment Survey (MSLES) instrument consists of 11 items measuring three dimensions of the learning environment – emotional climate, student-faculty interaction, and student-student interaction. Each subscale is calculated by summing across the items, which are measured on a 0-5 point scale. **Higher scores for each subscale indicate more positive perceptions of the learning environment.** Only participants who responded to every item on the scale are included in the summary statistics. For each subscale, the mean score, the standard deviation, and the number of respondents are displayed below. Additionally, a reliability estimate (Cronbach's alpha) is shown as a measure of internal consistency. The measure varies from 0 to 1, and an instrument is often considered to be reliable if the estimate is 0.7 or higher.

**Emotional Climate**

The emotional climate subscale combines the responses of three items assessing a student's affective response to the learning environment. These questions ask to what extent [or, how often] the educational experience leads to a sense of achievement, valuing oneself, and confidence in one's academic abilities. The possible range of responses for the emotional climate subscale is 0 to 15, and higher scores are correlated with positive perceptions of the learning environment.

| | | Reliability Estimate | Mean | Standard Deviation | Count |
|---|---|---|---|---|---|
| All Medical Schools | 2017 | 0.9 | 9.1 | 3.1 | 12,522 |
| All Medical Schools | 2016 | 0.9 | 9.2 | 3.1 | 11,627 |
| All Medical Schools | 2015 | 0.9 | 9.2 | 3.1 | 10,688 |

**Student-Student Interaction**

The student-student interaction subscale combines responses to four items assessing peer relations at the medical school. In addition to asking about perceived distance among students, these questions ask to what extent students get to know each other well, spend time assisting each other, and gather in informal activities. The possible range of responses for the student-student interaction subscale is 0 to 20, and higher scores are correlated with positive perceptions of the learning environment.

| | | Reliability Estimate | Mean | Standard Deviation | Count |
|---|---|---|---|---|---|
| All Medical Schools | 2017 | 0.8 | 14.8 | 3.1 | 12,497 |
| All Medical Schools | 2016 | 0.9 | 14.9 | 3.2 | 11,626 |
| All Medical Schools | 2015 | 0.8 | 15.1 | 3.0 | 10,677 |

**Student-Faculty Interaction**

The student-faculty interaction subscale combines responses to four items assessing a student's perception of faculty supportiveness. In addition to asking about perceived distance between faculty and students, these questions ask to what extent students feel that faculty are helpful when providing academic advice, when providing non-academic advice, and when answering questions and providing criticism. The possible range of responses for the student-faculty interaction subscale is 0 to 20, and higher scores are correlated with positive perceptions of the learning environment.

| | | Reliability Estimate | Mean | Standard Deviation | Count |
|---|---|---|---|---|---|
| All Medical Schools | 2017 | 0.8 | 14.8 | 3.2 | 12,518 |
| All Medical Schools | 2016 | 0.8 | 14.7 | 3.2 | 11,646 |
| All Medical Schools | 2015 | 0.8 | 14.8 | 3.2 | 10,710 |

**14. Think about how often you experience the following at your medical school. Determine your response by choosing one of the categories of frequency given below. Choose the category that best approximates your perceptions.**

| | | Percentage of Respondents Selecting Each Rating | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Never | Almost never | Sometimes | Fairly often | Very often | Always | Count |
| There are disconnects between what I am taught about professional behaviors/attitudes and what I see being demonstrated by faculty | | | | | | | | |
| All Medical Schools | 2017 | 18.6 | 46.2 | 24.0 | 5.5 | 4.1 | 1.5 | 12,705 |
| All Medical Schools | 2016 | 18.0 | 47.5 | 24.0 | 5.4 | 3.6 | 1.5 | 11,801 |
| All Medical Schools | 2015 | 17.7 | 46.4 | 24.3 | 5.9 | 4.3 | 1.4 | 10,837 |

**15. Please rate how often the following professional behaviors/attitudes are demonstrated by your medical school's faculty.**

| | | Percentage of Respondents Selecting Each Rating | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Never | Almost never | Sometimes | Fairly often | Very often | Always | Count |
| Respecting patient confidentiality | | | | | | | | |
| All Medical Schools | 2017 | 0.0 | 0.1 | 1.3 | 4.9 | 26.4 | 67.4 | 12,600 |
| All Medical Schools | 2016 | 0.1 | 0.1 | 1.3 | 4.9 | 27.2 | 66.4 | 11,645 |
| All Medical Schools | 2015 | 0.0 | 0.2 | 1.4 | 5.4 | 28.0 | 65.0 | 10,697 |
| Using professional language/avoiding derogatory language | | | | | | | | |
| All Medical Schools | 2017 | 0.7 | 0.6 | 2.4 | 8.3 | 38.1 | 49.9 | 12,591 |
| All Medical Schools | 2016 | 0.7 | 0.7 | 2.2 | 8.6 | 37.7 | 50.1 | 11,631 |
| All Medical Schools | 2015 | 0.5 | 1.0 | 2.6 | 8.9 | 38.3 | 48.6 | 10,684 |
| Dressing in a professional manner | | | | | | | | |
| All Medical Schools | 2017 | 0.0 | 0.2 | 1.2 | 5.1 | 30.2 | 63.2 | 12,554 |
| All Medical Schools | 2016 | 0.1 | 0.1 | 1.2 | 5.6 | 31.1 | 61.9 | 11,614 |
| All Medical Schools | 2015 | 0.0 | 0.1 | 1.3 | 5.4 | 32.5 | 60.7 | 10,667 |
| Resolving conflicts in ways that respect the dignity of all involved | | | | | | | | |
| All Medical Schools | 2017 | 0.2 | 0.7 | 4.6 | 11.2 | 37.3 | 45.9 | 12,529 |
| All Medical Schools | 2016 | 0.2 | 0.6 | 4.0 | 10.6 | 38.1 | 46.5 | 11,571 |
| All Medical Schools | 2015 | 0.2 | 0.5 | 4.3 | 11.0 | 39.0 | 45.0 | 10,627 |
| Being respectful of house staff and other physicians | | | | | | | | |
| All Medical Schools | 2017 | 0.1 | 0.2 | 1.9 | 7.2 | 34.7 | 55.9 | 12,564 |
| All Medical Schools | 2016 | 0.1 | 0.2 | 2.1 | 7.4 | 35.7 | 54.6 | 11,600 |
| All Medical Schools | 2015 | 0.0 | 0.2 | 2.1 | 7.9 | 36.6 | 53.1 | 10,649 |
| Respecting diversity | | | | | | | | |
| All Medical Schools | 2017 | 0.1 | 0.5 | 4.7 | 10.6 | 33.4 | 50.7 | 12,519 |
| All Medical Schools | 2016 | 0.2 | 0.6 | 4.5 | 10.5 | 33.7 | 50.5 | 11,539 |
| All Medical Schools | 2015 | 0.1 | 0.6 | 5.2 | 10.4 | 33.8 | 49.9 | 10,581 |
| Being respectful of other health professions | | | | | | | | |
| All Medical Schools | 2017 | 0.1 | 0.2 | 2.7 | 9.3 | 35.7 | 52.1 | 12,595 |
| All Medical Schools | 2016 | 0.1 | 0.4 | 2.9 | 9.7 | 37.0 | 50.0 | 11,632 |
| All Medical Schools | 2015 | 0.0 | 0.3 | 3.6 | 11.8 | 38.1 | 46.0 | 10,692 |
| Being respectful of other specialties | | | | | | | | |
| All Medical Schools | 2017 | 0.1 | 0.3 | 3.7 | 11.9 | 37.7 | 46.3 | 12,559 |
| All Medical Schools | 2016 | 0.1 | 0.4 | 3.6 | 12.5 | 38.7 | 44.6 | 11,596 |
| All Medical Schools | 2015 | 0.1 | 0.4 | 4.5 | 14.3 | 39.7 | 41.0 | 10,661 |

**15. Please rate how often the following professional behaviors/attitudes are demonstrated by your medical school's faculty. (Continued)**

| | | Percentage of Respondents Selecting Each Rating | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Never | Almost never | Sometimes | Fairly often | Very often | Always | Count |
| Being on time and managing a schedule well | | | | | | | | |
| All Medical Schools | 2017 | 0.3 | 1.2 | 7.0 | 18.9 | 40.4 | 32.2 | 12,572 |
| All Medical Schools | 2016 | 0.2 | 1.1 | 6.5 | 18.3 | 42.4 | 31.5 | 11,611 |
| All Medical Schools | 2015 | 0.3 | 1.0 | 7.1 | 19.0 | 42.5 | 30.1 | 10,682 |
| Providing direction and constructive feedback | | | | | | | | |
| All Medical Schools | 2017 | 0.4 | 1.8 | 9.0 | 18.6 | 37.8 | 32.3 | 12,554 |
| All Medical Schools | 2016 | 0.4 | 1.9 | 9.1 | 18.3 | 38.8 | 31.5 | 11,586 |
| All Medical Schools | 2015 | 0.3 | 2.0 | 9.4 | 19.2 | 38.7 | 30.3 | 10,658 |
| Showing respectful interaction with students | | | | | | | | |
| All Medical Schools | 2017 | 0.2 | 0.4 | 3.4 | 10.9 | 40.9 | 44.2 | 12,568 |
| All Medical Schools | 2016 | 0.2 | 0.5 | 3.6 | 10.4 | 41.6 | 43.7 | 11,620 |
| All Medical Schools | 2015 | 0.1 | 0.4 | 3.8 | 11.3 | 42.3 | 42.0 | 10,668 |
| Showing empathy and compassion | | | | | | | | |
| All Medical Schools | 2017 | 0.2 | 0.9 | 4.9 | 13.5 | 40.2 | 40.2 | 12,570 |
| All Medical Schools | 2016 | 0.3 | 0.8 | 5.2 | 13.8 | 40.9 | 39.0 | 11,611 |
| All Medical Schools | 2015 | 0.2 | 0.9 | 5.6 | 14.7 | 41.7 | 36.9 | 10,670 |

**16. Indicate whether you agree or disagree with the following statement.**

| | | Percentage of Respondents Selecting Each Rating | | | | | |
|---|---|---|---|---|---|---|---|
| | | Strongly disagree | Disagree | Neutral | Agree | Strongly agree | Count |
| My medical school has done a good job of fostering and nurturing my development as a person | | | | | | | |
| All Medical Schools | 2017 | 2.1 | 6.4 | 20.0 | 44.9 | 26.6 | 12,020 |
| All Medical Schools | 2016 | 2.2 | 6.4 | 20.0 | 44.0 | 27.4 | 11,073 |
| All Medical Schools | 2015 | 2.2 | 6.5 | 20.6 | 44.9 | 25.8 | 10,130 |
| My medical school has done a good job of fostering and nurturing my development as a future physician | | | | | | | |
| All Medical Schools | 2017 | 0.6 | 1.6 | 5.9 | 48.5 | 43.3 | 12,606 |
| All Medical Schools | 2016 | 0.5 | 1.6 | 5.9 | 47.8 | 44.1 | 11,667 |
| All Medical Schools | 2015 | 0.6 | 1.7 | 6.4 | 47.9 | 43.4 | 10,746 |

**17. Tolerance for Ambiguity (TFA) Scale**

Tolerance for Ambiguity (TFA) is a measure of one's ability to cope with situations of uncertainty. Scales measuring TFA have been used in prior research to show how ambiguity impacts medical education and medical care. TFA scores are calculated by summing across 7 items, which are measured on a 1-6 point scale. **The possible range of scores is 7 to 42, and higher scores are correlated with higher tolerance for ambiguity.** Only participants who responded to every item on the scale are included in the summary statistics. The mean TFA score, the standard deviation, and the number of respondents are displayed below. Additionally, a reliability estimate (Cronbach's alpha) is shown as a measure of internal consistency. The measure varies from 0 to 1, and an instrument is considered to be reliable if the estimate is 0.7 or higher.

| **Tolerance for Ambiguity (TFA) Scale** | | Reliability Estimate | Mean | Standard Deviation | Count |
|---|---|---|---|---|---|
| All Medical Schools | 2017 | 0.8 | 23.9 | 5.8 | 12,244 |
| All Medical Schools | 2016 | 0.8 | 24.0 | 5.8 | 11,323 |
| All Medical Schools | 2015 | 0.8 | 23.8 | 5.9 | 10,437 |

## 18. Interpersonal Reactivity Index (IRI)

The Interpersonal Reactivity Index (IRI) is a measure of individual differences in empathy. Scales measuring empathy have been used in prior research to show how levels of empathy may change throughout medical education. For Y2Q purposes, the IRI consists of 8 items. These include 4 items from each of the IRI subscales – perspective taking and empathic concern. IRI scores are calculated by summing across the 8 items, which are measured on a 0-4 point scale. **The possible range of scores is 0 to 32, and higher scores are correlated with higher levels of empathy.** Only participants who responded to every item on the scale are included in the summary statistics. The mean IRI score, the standard deviation, and the number of respondents are displayed below. Additionally, a reliability estimate (Cronbach's alpha) is shown as a measure of internal consistency. The measure varies from 0 to 1, and an instrument is considered to be reliable if the estimate is 0.7 or higher.

| Interpersonal Reactivity Index (IRI) | | Reliability Estimate | Mean | Standard Deviation | Count |
|---|---|---|---|---|---|
| All Medical Schools | 2017 | 0.8 | 24.1 | 4.4 | 12,164 |
| All Medical Schools | 2016 | 0.8 | 23.9 | 4.5 | 11,213 |
| All Medical Schools | 2015 | 0.8 | 23.9 | 4.5 | 10,313 |

## 19. In which of the following activities do you plan to participate during your career?

**Note: Percentages may not sum to 100% as multiple responses are allowed.**

| | All Schools 2015 | All Schools 2016 | All Schools 2017 |
|---|---|---|---|
| | Percent | Percent | Percent |
| Patient Care | 98.3 | 98.2 | 98.2 |
| Research | 47.0 | 48.1 | 48.1 |
| Teaching | 62.7 | 62.1 | 62.7 |
| Medical School Faculty | 33.9 | 33.2 | 33.4 |
| Administration (e.g., Department Chair, Dean) | 21.5 | 22.0 | 22.2 |
| Military Service | 4.8 | 4.7 | 4.7 |
| Public Health | 30.1 | 32.0 | 32.2 |
| Other | 3.0 | 3.4 | 3.2 |
| Number of respondents | 10,554 | 11,454 | 12,398 |

## 20. Do you anticipate providing patient care full-time or part-time?

**Note: Only those who selected "Patient Care" at Q19 could respond to this item.**

| | All Schools 2015 | All Schools 2016 | All Schools 2017 |
|---|---|---|---|
| | Percent | Percent | Percent |
| Full-time (at least 36 hours a week) | 86.2 | 87.3 | 87.4 |
| Part-time (less than 36 hours a week) | 13.8 | 12.7 | 12.6 |
| Number of respondents | 10,340 | 11,226 | 12,153 |

## 21. How exclusively do you expect to be involved in research?

**Note: Only those who selected "Research" at Q19 could respond to this item.**

| | All Schools 2015 | All Schools 2016 | All Schools 2017 |
|---|---|---|---|
| | Percent | Percent | Percent |
| Full-time | 2.8 | 2.7 | 2.8 |
| Significantly involved | 41.3 | 41.9 | 40.6 |
| Involved in a limited way | 55.9 | 55.5 | 56.7 |
| Number of respondents | 4,953 | 5,504 | 5,955 |

**22. What general specialty are you considering?**

| | All Schools | | |
|---|---|---|---|
| | 2015 | 2016 | 2017 |
| | Percent | Percent | Percent |
| Anesthesiology or subspecialty | 2.4 | 2.4 | 2.4 |
| Dermatology or subspecialty | 1.6 | 1.5 | 1.9 |
| Emergency Medicine or subspecialty | 9.7 | 9.8 | 10.1 |
| Family Medicine or subspecialty | 6.7 | 5.9 | 5.3 |
| Internal Medicine or subspecialty | 17.3 | 17.2 | 17.5 |
| Internal Medicine/Pediatrics | 2.7 | 2.9 | 2.8 |
| Medical Genetics or subspecialty | 0.1 | 0.2 | 0.1 |
| Neurological Surgery | 1.7 | 1.5 | 1.7 |
| Neurology or subspecialty | 2.7 | 2.8 | 2.8 |
| Nuclear Medicine | 0.0 | 0.0 | 0.0 |
| Obstetrics and Gynecology or subspecialty | 4.8 | 5.2 | 5.1 |
| Ophthalmology or subspecialty | 2.2 | 2.0 | 2.3 |
| Orthopaedic Surgery or subspecialty | 5.2 | 5.0 | 4.8 |
| Otolaryngology or subspecialty | 1.4 | 1.5 | 1.7 |
| Pathology or subspecialty | 1.0 | 0.8 | 0.8 |
| Pediatrics or subspecialty | 10.1 | 10.5 | 9.5 |
| Physical Medicine and Rehabilitation or subspecialty | 1.0 | 0.8 | 0.8 |
| Plastic Surgery or subspecialty | 0.9 | 0.9 | 1.1 |
| Preventive Medicine or subspecialty | 0.2 | 0.1 | 0.1 |
| Psychiatry or subspecialty | 2.1 | 2.2 | 2.6 |
| Radiation Oncology | 0.9 | 0.8 | 0.7 |
| Radiology or subspecialty | 2.2 | 2.2 | 2.4 |
| Surgery or subspecialty | 7.1 | 7.9 | 8.0 |
| Thoracic Surgery or subspecialty | 0.9 | 0.8 | 0.7 |
| Urology or subspecialty | 1.0 | 1.0 | 0.9 |
| Vascular Surgery or subspecialty | 0.3 | 0.1 | 0.3 |
| Undecided | 13.8 | 13.8 | 13.5 |
| I do not plan to practice medicine | 0.1 | 0.1 | 0.1 |
| Number of respondents | 10,560 | 11,472 | 12,424 |

**23. You selected an interest in Family Medicine, Internal Medicine, Internal Medicine/Pediatrics, Obstetrics and Gynecology, or Pediatrics. What career are you considering?**
**Note: Only those who responded "Family Medicine," "Internal Medicine," "Internal Medicine/Pediatrics," "Obstetrics and Gynecology," or "Pediatrics" to Q22 could respond to this item.**

| | | | |
|---|---|---|---|
| | Percent | Percent | Percent |
| Primary care practice (i.e., office-based continuing care in general Family Medicine, general Internal Medicine, or general Pediatrics) | 26.5 | 25.3 | 23.6 |
| Hospitalist (i.e., salaried, full-time care of hospitalized patients) | 7.0 | 7.1 | 7.5 |
| Sub-specialty (e.g., Cardiology, Pediatric Oncology, Family Medicine/Sports Medicine) | 46.1 | 47.3 | 48.6 |
| Undecided | 20.4 | 20.3 | 20.3 |
| Number of respondents | 4,385 | 4,788 | 4,993 |

**24. When thinking about your career path after medical school, how important are the following considerations?**

| | | Percentage of Respondents Selecting Each Rating | | | | |
|---|---|---|---|---|---|---|
| | | Not important | Somewhat important | Very important | Essential | Count |
| Working for social change | | | | | | |
| All Medical Schools | 2017 | 8.1 | 35.8 | 36.4 | 19.7 | 12,374 |
| All Medical Schools | 2016 | 9.4 | 36.9 | 34.7 | 19.0 | 11,426 |
| All Medical Schools | 2015 | 9.5 | 38.8 | 34.0 | 17.6 | 10,516 |
| High income potential | | | | | | |
| All Medical Schools | 2017 | 13.9 | 51.1 | 29.0 | 6.0 | 12,367 |
| All Medical Schools | 2016 | 16.3 | 51.5 | 27.4 | 4.8 | 11,413 |
| All Medical Schools | 2015 | 17.3 | 51.9 | 26.2 | 4.7 | 10,512 |
| Social recognition or status | | | | | | |
| All Medical Schools | 2017 | 38.0 | 44.8 | 14.8 | 2.4 | 12,368 |
| All Medical Schools | 2016 | 37.4 | 46.2 | 14.5 | 1.9 | 11,415 |
| All Medical Schools | 2015 | 36.6 | 46.4 | 14.9 | 2.1 | 10,510 |
| Stable, secure future | | | | | | |
| All Medical Schools | 2017 | 0.9 | 12.2 | 44.9 | 42.0 | 12,383 |
| All Medical Schools | 2016 | 1.0 | 11.0 | 45.5 | 42.5 | 11,437 |
| All Medical Schools | 2015 | 0.8 | 11.9 | 43.4 | 43.8 | 10,528 |
| Creativity and initiative | | | | | | |
| All Medical Schools | 2017 | 4.9 | 33.2 | 42.7 | 19.1 | 12,371 |
| All Medical Schools | 2016 | 4.9 | 32.4 | 42.8 | 19.9 | 11,425 |
| All Medical Schools | 2015 | 4.3 | 31.4 | 43.7 | 20.6 | 10,530 |
| Expression of personal values | | | | | | |
| All Medical Schools | 2017 | 4.0 | 23.8 | 43.4 | 28.7 | 12,370 |
| All Medical Schools | 2016 | 4.6 | 24.1 | 42.9 | 28.3 | 11,408 |
| All Medical Schools | 2015 | 4.7 | 24.0 | 42.7 | 28.6 | 10,513 |
| Availability of jobs | | | | | | |
| All Medical Schools | 2017 | 3.0 | 24.9 | 49.6 | 22.4 | 12,382 |
| All Medical Schools | 2016 | 2.3 | 23.4 | 50.1 | 24.2 | 11,432 |
| All Medical Schools | 2015 | 2.4 | 23.7 | 47.9 | 25.9 | 10,526 |
| Leadership potential | | | | | | |
| All Medical Schools | 2017 | 7.7 | 34.0 | 40.9 | 17.4 | 12,371 |
| All Medical Schools | 2016 | 7.4 | 34.4 | 40.9 | 17.3 | 11,422 |
| All Medical Schools | 2015 | 7.3 | 34.5 | 40.5 | 17.8 | 10,513 |
| Work/life balance | | | | | | |
| All Medical Schools | 2017 | 1.3 | 12.5 | 35.8 | 50.4 | 12,382 |
| All Medical Schools | 2016 | 1.4 | 13.1 | 35.0 | 50.6 | 11,437 |
| All Medical Schools | 2015 | 1.3 | 12.0 | 34.7 | 52.0 | 10,527 |
| Ability to pay off debt | | | | | | |
| All Medical Schools | 2017 | 12.5 | 17.1 | 31.9 | 38.5 | 12,376 |
| All Medical Schools | 2016 | 13.1 | 17.1 | 30.3 | 39.5 | 11,431 |
| All Medical Schools | 2015 | 12.6 | 17.2 | 29.7 | 40.5 | 10,517 |

**24. When thinking about your career path after medical school, how important are the following considerations? (Continued)**

| | | Percentage of Respondents Selecting Each Rating | | | | |
|---|---|---|---|---|---|---|
| | | Not important | Somewhat important | Very important | Essential | Count |
| Opportunity for innovation | | | | | | |
| All Medical Schools | 2017 | 6.5 | 37.0 | 37.8 | 18.6 | 12,357 |
| All Medical Schools | 2016 | 6.6 | 36.8 | 37.3 | 19.3 | 11,422 |
| All Medical Schools | 2015 | 6.3 | 36.6 | 36.6 | 20.5 | 10,522 |

**25. Indicate whether you agree or disagree with the following statement:**

| | | Percentage of Respondents Selecting Each Rating | | | | | |
|---|---|---|---|---|---|---|---|
| | | No | Probably not | Neutral | Probably yes | Yes | Count |
| If you could revisit your career choice, would you choose to attend medical school again? | | | | | | | |
| All Medical Schools | 2017 | 1.0 | 3.1 | 6.2 | 29.0 | 60.8 | 12,414 |
| All Medical Schools | 2016 | 0.9 | 2.7 | 6.6 | 28.5 | 61.3 | 11,467 |
| All Medical Schools | 2015 | 1.0 | 3.1 | 6.7 | 28.5 | 60.7 | 10,558 |

## 26. Quality of Life (QOL) Scale

The Quality of Life (QOL) scale, which includes items from the Linear Analogue Self-Assessment Scale (LASA-6), is a measure of the following aspects of life: overall quality of life, mental (intellectual) well-being, physical well-being, emotional well-being, level of social activity, and spiritual well-being. The QOL questions ask about feelings that respondents experienced in the past week. QOL scores are calculated by summing across the six items, which are measured on a 0-10 point scale. **The possible range of responses is 0 to 60, and higher scores are correlated with higher quality of life.** Only participants who responded to every item on the scale are included in the summary statistics. The mean QOL score, the standard deviation, and the number of respondents are displayed below. Additionally, a reliability estimate (Cronbach's alpha) is shown as a measure of internal consistency. The measure varies from 0 to 1, and an instrument is often considered to be reliable if the estimate is 0.7 or higher.

| | | Reliability Estimate | Mean | Standard Deviation | Count |
|---|---|---|---|---|---|
| All Medical Schools | 2017 | 0.9 | 40.2 | 10.1 | 12,258 |
| All Medical Schools | 2016 | 0.9 | 40.6 | 10.1 | 11,311 |
| All Medical Schools | 2015 | 0.9 | 40.1 | 10.2 | 10,402 |

**Additional Quality of Life (QOL) Scales**

Additional Quality of Life (QOL) items are also taken from the Linear Analogue Self-Assessment Scale (LASA) and are distinct measures of the following aspects of life: level of fatigue, level of social support from family and friends, and level of financial concerns. The QOL questions ask about feelings that respondents experienced in the past week, and the scores are calculated individually on 0-10 point scales. **The possible range of responses is 0 to 10, and higher scores represent more positive outcomes: no fatigue, higher levels of social support from family and friends, and no financial concerns.** The summary statistics displayed below include the mean score, the standard deviation, and the number of respondents. Because the additional QOL items are calculated individually, the internal consistency estimate is not provided.

| **QOL - Level of fatigue (0 = Constant tiredness, 10 = No fatigue)** | | Mean | Standard Deviation | Count |
|---|---|---|---|---|
| All Medical Schools | 2017 | 4.8 | 2.3 | 12,380 |
| All Medical Schools | 2016 | 4.8 | 2.3 | 11,431 |
| All Medical Schools | 2015 | 4.8 | 2.3 | 10,513 |

| **QOL - Level of social support from family and friends (0 = No support, 10 = Highest level of support)** | | Mean | Standard Deviation | Count |
|---|---|---|---|---|
| All Medical Schools | 2017 | 8.1 | 1.9 | 12,374 |
| All Medical Schools | 2016 | 8.1 | 2.0 | 11,415 |
| All Medical Schools | 2015 | 8.0 | 2.0 | 10,500 |

| **QOL - Level of financial concerns (0 = Constant concerns, 10 = No concerns)** | | Mean | Standard Deviation | Count |
|---|---|---|---|---|
| All Medical Schools | 2017 | 5.5 | 3.0 | 12,382 |
| All Medical Schools | 2016 | 5.5 | 3.0 | 11,437 |
| All Medical Schools | 2015 | 5.4 | 3.0 | 10,529 |

## 27. Perceived Stress Scale - 4

The Perceived Stress Scale - 4 (PSS-4) is a four-item version of a widely used instrument for measuring the perception of stress. The scale measures the degree to which situations in one's life are considered stressful. The scale also includes a number of direct questions about current levels of experienced stress. The PSS-4 also includes questions that ask about feelings and thoughts that respondents experienced during the last month. In each case, respondents are asked how often they felt a certain way. PSS-4 scores are calculated by summing across four items, which are measured on a 0-4 point scale. **The possible range of scores is 0 to 16, and higher scores are correlated with higher perceived levels of stress.** Only participants who responded to every item on the scale are included in the summary statistics. The mean PSS-4 score, the standard deviation, and the number of respondents are displayed below. Additionally, a reliability estimate (Cronbach's alpha) is shown as a measure of internal consistency. The measure varies from 0 to 1, and an instrument is often considered to be reliable if the estimate is 0.7 or higher.

| | | Reliability Estimate | Mean | Standard Deviation | Count |
|---|---|---|---|---|---|
| All Medical Schools | 2017 | 0.8 | 5.8 | 2.9 | 12,286 |
| All Medical Schools | 2016 | 0.8 | 5.7 | 2.9 | 11,326 |
| All Medical Schools | 2015 | 0.8 | 5.8 | 2.9 | 10,419 |

## 28. Oldenburg Burnout Inventory for Medical Students Scale

The Oldenburg Burnout Inventory for Medical Students (OLBI-MS) is a modified and shortened version of the Oldenburg Burnout Inventory (OLBI). The OLBI-MS instrument consists of 16 items measuring two dimensions of burnout – exhaustion and disengagement. Each subscale is calculated by summing across the items, which are measured on a 0-3 point scale. **Higher scores are correlated with higher levels of burnout.** Only participants who responded to every item on the scale are included in the summary statistics. For each subscale, the mean score, the standard deviation, and the number of respondents are displayed below. Additionally, a reliability estimate (Cronbach's alpha) is shown as a measure of internal consistency. The measure varies from 0 to 1, and an instrument is often considered to be reliable if the estimate is 0.7 or higher.

### Disengagement

The disengagement subscale includes eight items on a 0-3 point scale and refers to distancing oneself from the object and content of medical school work and to negative attitudes toward medical school in general. The possible range of responses for the disengagement subscale is 0 to 24, and higher scores are correlated with higher levels of burnout.

| | | Reliability Estimate | Mean | Standard Deviation | Count |
|---|---|---|---|---|---|
| All Medical Schools | 2017 | 0.8 | 9.8 | 3.7 | 12,074 |
| All Medical Schools | 2016 | 0.8 | 9.7 | 3.7 | 11,145 |
| All Medical Schools | 2015 | 0.8 | 9.7 | 3.7 | 10,215 |

### Exhaustion

The exhaustion subscale includes eight items on a 0-3 point scale and refers to the cognitive and physical strain as a consequence of the demands of medical school. The possible range of responses for the exhaustion subscale is 0 to 24, and higher scores are correlated with higher levels of burnout.

| | | Reliability Estimate | Mean | Standard Deviation | Count |
|---|---|---|---|---|---|
| All Medical Schools | 2017 | 0.8 | 11.8 | 3.9 | 12,055 |
| All Medical Schools | 2016 | 0.8 | 11.7 | 3.8 | 11,066 |
| All Medical Schools | 2015 | 0.8 | 11.8 | 3.9 | 10,206 |

**29. In thinking about a typical week during your pre-clerkship education, please provide the average number of hours PER DAY that you spent doing the following activities.**
**Note: Responses needed to total 24 hours.**

| | All Schools | | |
|---|---|---|---|
| | **2015** | **2016** | **2017** |
| **Sleep** | | | |
| | Percent | Percent | Percent |
| Less than 5 hours | 0.7 | 0.6 | 0.5 |
| 5.0 to 5.9 hours | 4.1 | 3.9 | 3.7 |
| 6.0 to 6.9 hours | 24.5 | 21.8 | 22.0 |
| 7.0 to 7.9 hours | 39.7 | 41.5 | 41.2 |
| 8.0 or more hours | 31.0 | 32.2 | 32.5 |
| Median hours of sleep | 7 | 7 | 7 |
| **Educational activities (e.g., attending class, studying)** | | | |
| | Percent | Percent | Percent |
| Less than 7 hours | 7.8 | 8.2 | 8.0 |
| 7.0 to 8.9 hours | 19.2 | 19.2 | 19.5 |
| 9.0 to 10.9 hours | 31.0 | 32.4 | 32.0 |
| 11.0 to 12.9 hours | 26.8 | 25.5 | 26.1 |
| 13.0 or more hours | 15.2 | 14.7 | 14.5 |
| Median hours of educational activities | 10 | 10 | 10 |
| **Non-educational activities (e.g., being with friends/family, solitary recreation)** | | | |
| | Percent | Percent | Percent |
| Less than 3 hours | 32.5 | 33.4 | 32.9 |
| 3.0 to 4.9 hours | 40.6 | 40.9 | 40.8 |
| 5.0 to 6.9 hours | 18.8 | 18.1 | 18.4 |
| 7.0 to 8.9 hours | 6.2 | 5.6 | 6.0 |
| 9.0 or more hours | 1.8 | 2.0 | 1.9 |
| Median hours of non-educational activities | 3 | 3 | 3 |
| **Paid work** | | | |
| | Percent | Percent | Percent |
| Zero hours | 91.2 | 90.4 | 90.8 |
| Less than 1 hour | 1.5 | 1.4 | 1.5 |
| 1.0 to 1.9 hours | 3.7 | 4.6 | 4.3 |
| 2.0 to 2.9 hours | 2.1 | 2.2 | 2.0 |
| 3.0 or more hours | 1.5 | 1.5 | 1.4 |
| Median hours of paid work | 0 | 0 | 0 |
| **Exercise/sports** | | | |
| | Percent | Percent | Percent |
| Zero hours | 16.9 | 16.6 | 17.7 |
| Less than 1 hour | 14.7 | 14.1 | 13.6 |
| 1.0 to 1.9 hours | 50.1 | 50.8 | 49.9 |
| 2.0 to 2.9 hours | 16.4 | 16.3 | 16.7 |
| 3.0 or more hours | 2.0 | 2.3 | 2.2 |
| Median hours of exercise/sports | 1 | 1 | 1 |

**29. In thinking about a typical week during your pre-clerkship education, please provide the average number of hours PER DAY that you spent doing the following activities.**
**Note: Responses needed to total 24 hours. (Continued)**

**Other**

| | All Schools | | |
|---|---|---|---|
| | **2015** | **2016** | **2017** |
| | Percent | Percent | Percent |
| Zero hours | 33.3 | 33.2 | 33.1 |
| Less than 1 hour | 1.3 | 1.3 | 1.2 |
| 1.0 to 1.9 hours | 12.4 | 12.0 | 11.9 |
| 2.0 to 2.9 hours | 19.6 | 19.0 | 19.5 |
| 3.0 or more hours | 33.4 | 34.5 | 34.3 |
| Median hours of other activities | 2 | 2 | 2 |
| Number of respondents | 10,389 | 11,261 | 12,181 |

**30. For each of the following behaviors, please indicate the frequency you personally experienced that behavior during medical school. Include in your response any behaviors performed by faculty, nurses, residents/interns, other institution employees or staff, and other students. Please do not include behaviors performed by patients.**
**During medical school, how frequently have you...**

| | | Percentage of Respondents Selecting Each Rating | | | | |
|---|---|---|---|---|---|---|
| | | Never | Once | Occasionally | Frequently | Count |
| Been publicly embarrassed? | | | | | | |
| All Medical Schools | 2017 | 76.5 | 14.8 | 8.3 | 0.4 | 12,254 |
| All Medical Schools | 2016 | 76.4 | 14.5 | 8.8 | 0.3 | 11,330 |
| All Medical Schools | 2015 | 75.4 | 14.8 | 9.4 | 0.4 | 10,427 |
| Been publicly humiliated? | | | | | | |
| All Medical Schools | 2017 | 92.1 | 5.5 | 2.2 | 0.2 | 12,240 |
| All Medical Schools | 2016 | 92.1 | 5.5 | 2.2 | 0.2 | 11,313 |
| All Medical Schools | 2015 | 91.9 | 5.5 | 2.3 | 0.2 | 10,417 |
| Been threatened with physical harm? | | | | | | |
| All Medical Schools | 2017 | 99.1 | 0.6 | 0.3 | 0.0 | 12,224 |
| All Medical Schools | 2016 | 99.0 | 0.7 | 0.2 | 0.1 | 11,306 |
| All Medical Schools | 2015 | 99.2 | 0.6 | 0.2 | 0.0 | 10,406 |
| Been physically harmed? | | | | | | |
| All Medical Schools | 2017 | 99.3 | 0.4 | 0.2 | 0.0 | 12,234 |
| All Medical Schools | 2016 | 99.3 | 0.4 | 0.2 | 0.1 | 11,299 |
| All Medical Schools | 2015 | 99.3 | 0.5 | 0.2 | 0.0 | 10,416 |
| Been required to perform personal services? | | | | | | |
| All Medical Schools | 2017 | 97.7 | 0.6 | 1.1 | 0.5 | 12,249 |
| All Medical Schools | 2016 | 97.5 | 0.6 | 1.2 | 0.6 | 11,320 |
| All Medical Schools | 2015 | 97.3 | 0.7 | 1.3 | 0.7 | 10,427 |

**30. For each of the following behaviors, please indicate the frequency you personally experienced that behavior during medical school. Include in your response any behaviors performed by faculty, nurses, residents/interns, other institution employees or staff, and other students. Please do not include behaviors performed by patients.**
**During medical school, how frequently have you... (Continued)**

| | | Percentage of Respondents Selecting Each Rating | | | | |
|---|---|---|---|---|---|---|
| | | Never | Once | Occasionally | Frequently | Count |
| Been subjected to unwanted sexual advances? | | | | | | |
| All Medical Schools | 2017 | 96.7 | 2.0 | 1.2 | 0.1 | 12,236 |
| All Medical Schools | 2016 | 97.1 | 1.8 | 1.0 | 0.1 | 11,309 |
| All Medical Schools | 2015 | 97.3 | 1.5 | 1.1 | 0.0 | 10,419 |
| Been asked to exchange sexual favors for grades or other rewards? | | | | | | |
| All Medical Schools | 2017 | 99.8 | 0.1 | 0.1 | 0.0 | 12,240 |
| All Medical Schools | 2016 | 99.7 | 0.1 | 0.2 | 0.0 | 11,312 |
| All Medical Schools | 2015 | 99.7 | 0.1 | 0.2 | 0.0 | 10,423 |
| Been denied opportunities for training or rewards based on gender? | | | | | | |
| All Medical Schools | 2017 | 97.2 | 1.4 | 1.1 | 0.3 | 12,232 |
| All Medical Schools | 2016 | 97.7 | 1.2 | 1.0 | 0.2 | 11,299 |
| All Medical Schools | 2015 | 97.7 | 1.2 | 0.9 | 0.2 | 10,397 |
| Been subjected to offensive sexist remarks/names? | | | | | | |
| All Medical Schools | 2017 | 88.7 | 5.6 | 5.2 | 0.5 | 12,184 |
| All Medical Schools | 2016 | 89.9 | 5.2 | 4.5 | 0.4 | 11,248 |
| All Medical Schools | 2015 | 90.7 | 4.7 | 4.3 | 0.3 | 10,370 |
| Received lower evaluations or grades solely because of gender rather than performance? | | | | | | |
| All Medical Schools | 2017 | 98.4 | 0.9 | 0.6 | 0.0 | 12,255 |
| All Medical Schools | 2016 | 98.4 | 0.9 | 0.5 | 0.1 | 11,317 |
| All Medical Schools | 2015 | 98.6 | 0.8 | 0.5 | 0.1 | 10,418 |
| Been denied opportunities for training or rewards based on race or ethnicity? | | | | | | |
| All Medical Schools | 2017 | 96.6 | 1.2 | 1.7 | 0.5 | 12,243 |
| All Medical Schools | 2016 | 96.8 | 1.1 | 1.6 | 0.5 | 11,315 |
| All Medical Schools | 2015 | 96.7 | 1.2 | 1.7 | 0.5 | 10,420 |
| Been subjected to racially or ethnically offensive remarks/names? | | | | | | |
| All Medical Schools | 2017 | 93.8 | 3.3 | 2.7 | 0.3 | 12,230 |
| All Medical Schools | 2016 | 93.8 | 3.4 | 2.5 | 0.3 | 11,297 |
| All Medical Schools | 2015 | 94.4 | 2.7 | 2.6 | 0.3 | 10,407 |
| Received lower evaluations or grades solely because of race or ethnicity rather than performance? | | | | | | |
| All Medical Schools | 2017 | 98.9 | 0.5 | 0.5 | 0.1 | 12,234 |
| All Medical Schools | 2016 | 99.0 | 0.6 | 0.3 | 0.1 | 11,301 |
| All Medical Schools | 2015 | 99.0 | 0.5 | 0.4 | 0.0 | 10,397 |
| Been denied opportunities for training or rewards based on sexual orientation? | | | | | | |
| All Medical Schools | 2017 | 99.4 | 0.2 | 0.3 | 0.0 | 12,237 |
| All Medical Schools | 2016 | 99.5 | 0.2 | 0.3 | 0.1 | 11,314 |
| All Medical Schools | 2015 | 99.4 | 0.3 | 0.3 | 0.0 | 10,422 |
| Been subjected to offensive remarks/names related to sexual orientation? | | | | | | |
| All Medical Schools | 2017 | 98.2 | 0.8 | 0.8 | 0.1 | 12,214 |
| All Medical Schools | 2016 | 98.2 | 0.9 | 0.8 | 0.1 | 11,287 |
| All Medical Schools | 2015 | 97.9 | 1.1 | 1.0 | 0.1 | 10,400 |

**30. For each of the following behaviors, please indicate the frequency you personally experienced that behavior during medical school. Include in your response any behaviors performed by faculty, nurses, residents/interns, other institution employees or staff, and other students. Please do not include behaviors performed by patients.**
**During medical school, how frequently have you... (Continued)**

| | | Percentage of Respondents Selecting Each Rating | | | | |
|---|---|---|---|---|---|---|
| | | Never | Once | Occasionally | Frequently | Count |
| Received lower evaluations or grades solely because of sexual orientation rather than performance? | | | | | | |
| All Medical Schools | 2017 | 99.7 | 0.1 | 0.2 | 0.0 | 12,209 |
| All Medical Schools | 2016 | 99.7 | 0.2 | 0.1 | 0.0 | 11,292 |
| All Medical Schools | 2015 | 99.7 | 0.1 | 0.2 | 0.0 | 10,393 |

| | All Schools | | |
|---|---|---|---|
| | 2015 | 2016 | 2017 |
| **31. Percent of respondents who indicated they personally experienced any of the listed behaviors, excluding "publicly embarrassed." The data are derived from the responses to the survey question reported in Q30 above.** | Percent | Percent | Percent |
| Yes | 23.8 | 24.2 | 25.9 |
| No | 76.2 | 75.8 | 74.1 |
| Number of respondents | 10,437 | 11,337 | 12,267 |
| **32. Gender Identity:** | | | |
| **Note: The results are derived from two questions: "What sex were you assigned at birth?" (response options "Male" or "Female") and "What is your current gender identity?" (response options "Male," "Female," "Trans male/trans man," "Trans female/trans woman," "Genderqueer/gender non-conforming," or "Different identity").** | Percent | Percent | Percent |
| Same gender identity as the sex assigned at birth | | 99.5 | 99.4 |
| Different gender identity from the sex assigned at birth | | 0.5 | 0.6 |
| Number of respondents | | 11,356 | 12,261 |
| **33. How do you self-identify?** | Percent | Percent | Percent |
| Bisexual | 3.0 | 3.7 | 3.8 |
| Gay or lesbian | 3.6 | 4.0 | 4.1 |
| Heterosexual or straight | 93.4 | 92.4 | 92.1 |
| Number of respondents | 10,361 | 11,285 | 12,175 |

**34. Control of medical school:**
**Note: This information is populated from other AAMC data sources.**

| | Percent | Percent | Percent |
|---|---|---|---|
| Private | 39.1 | 37.6 | 38.0 |
| Public | 60.9 | 62.4 | 62.0 |
| Number of respondents | 11,586 | 12,457 | 13,467 |

**35. Region of medical school:**
**Note: This information is populated from other AAMC data sources.**

| | Percent | Percent | Percent |
|---|---|---|---|
| Central | 26.9 | 28.6 | 26.9 |
| Northeast | 28.1 | 27.9 | 27.7 |
| South | 33.9 | 33.2 | 34.7 |
| West | 11.1 | 10.4 | 10.7 |
| Number of respondents | 11,586 | 12,457 | 13,467 |

## 2017 Y2Q References

Each item number below refers to the question number in the 2017 Y2Q All Schools Summary Report.

**Q13. Medical School Learning Environment Survey (MSLES)**

Marshall RE. Measuring the medical school learning environment. *Journal of medical education.* 1978;53(2):98-104.

**Q17**. **Tolerance for Ambiguity (TFA)**

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Caulfield M, Andolsek K, Grbic D, Roskovensky L. Ambiguity tolerance of students matriculating to U.S. medical schools. *Acad Med.* 2014;89(11):1526-1532.

**Q18. Interpersonal Reactivity Index (IRI)**

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**Q26: Quality of Life (QOL) Scale**

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**Q27: Perceived Stress Scale (PSS-4) Scale**

Warttig SL, Forshaw MJ, South J, White AK. New, normative, English-sample data for the Short Form Perceived Stress Scale (PSS-4). *Journal of health psychology.* 2013;18(12):1617-1628.

Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *Journal of health and social behavior*. 1983; 24(4):385-396.

**Q28**. **Oldenburg Burnout Inventory for Medical Students Scale**

Halbesleben JRB, Demerouti E. The construct validity of an alternative measure of burnout: Investigating the English translation of the Oldenburg Burnout Inventory. *Work and Stress*. 2005;19(3):208-220.

# CREATING A COMMUNITY OF INNOVATION

The work of the AMA Accelerating Change in Medical Education Consortium

AMA
AMERICAN MEDICAL ASSOCIATION

**Suggested citation: American Medical Association. Creating a Community of Innovation. Chicago, IL. American Medical Association; 2017**


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# A time of transformative change

With the American Medical Association "Accelerating Change in Medical Education" initiative approaching the end of its first five years, it's time to celebrate our considerable achievements while turning our attention to the work ahead and our future path forward.

We begin this new phase by building on the tremendous momentum we've already created. We have no intention of slowing down as we lay the groundwork for another productive five years and beyond.

For many years there has been general consensus that medical education—based largely on an educational model more than a century old—has needed to change in order to address significant gaps in physician training and prepare new doctors to practice effectively in our 21st century health systems.

To help fill these gaps, and as part of its larger strategic focus to improve our nation's health, the AMA launched the "Accelerating Change in Medical Education" initiative in 2013. After awarding initial grants to 11 medical schools from across the country, the AMA brought these schools together to form the AMA Accelerating Change in Medical Education Consortium—a unique, innovative collaborative that allowed for the sharing and dissemination of groundbreaking ideas and projects.

In 2016 the AMA awarded grants to another 21 schools. Today, the 32-member consortium, which represents almost one-fifth of allopathic and osteopathic medical schools, is delivering forward-thinking educational experiences to approximately 19,000 medical students—students who will provide care to a potential 33 million patients annually.

**But there is still more work to be done.**

As consortium members continue to implement bold ideas and demonstrate a deep commitment to creating the medical schools of the future, their solutions are being disseminated to the greater academic community. These pioneering efforts are facilitating the widespread adoption of new ideas.

The consortium's vision, however, extends well into the future. Working with entities from across the physician education continuum, including graduate and continuing medical education, the consortium is actively promoting the concept of lifelong physician learning. The consortium regularly hosts meetings and activities with national stakeholders in medical education—including the Association of American Medical Colleges, the Accreditation Council for Graduate Medical Education, the Liaison Committee on Medical Education, the Federation of State Medical Boards, the National Board of Medical Examiners, the National Center for Interprofessional Practice and Education, and the National Resident Matching Program. These rich, varied perspectives have inspired creative thinking and provided important input on how best to design medical school curriculum for sustainable transformation.

This report is not an exhaustive list of the consortium schools' many achievements. Rather, it presents some of the best innovations emerging and captures the inspiring, collaborative effort involved in this exciting and challenging journey to reimagine physician education from the ground up.

On the following pages you will learn how the consortium is evaluating its impact so that evidence-based, best practices can be developed, evaluated, shared and implemented across all medical schools. You will also learn how member schools have implemented:

- Health systems science, the third pillar of medical education
- Curriculum on leadership, telemedicine, social determinants of health, patient safety and quality
- Faculty development on these subjects
- Electronic health record systems designed for teaching
- Databases built to support education on population health
- Technology to teach communication skills across language barriers
- Value-added opportunities for medical students
- Programs that embed medical students long term with community health entities
- Interprofessional education
- Flexible competency-based pathways
- The master adaptive learner model
- Improved transitions to residency

Dozens of papers in peer-reviewed scientific journals (see annotated bibliography) and hundreds of presentations at medical education and health professions meetings are clear evidence of the impact the consortium's work is already having.

I would like to thank consortium member schools, and those at the AMA including our CEO and Executive Vice President James L. Madara, MD, and our AMA Board of Trustees, who have been integral to the success of these projects. As we move into the next phase, the AMA will continue its strong commitment to support a community of innovation in medical education through the consortium, as well as new funding initiatives to support the transition from medical school to residency training and beyond.

No one entity, organization, school, university or academic institution has all the solutions for reforming medical education. Together we can address today's challenges and make a positive, meaningful difference in how future physicians are trained.

Join us as we continue the inspiring journey to change medical education for the better and, in turn, improve our nation's health.

**Susan E. Skochelak, MD, MPH**
Group vice president
Medical Education, AMA

# Evaluating the impact of the AMA Accelerating Change in Medical Education Consortium

**The plan to measure the effectiveness of the consortium's activities**

Evaluation, as a means to measure success, has been a pivotal piece of the AMA's "Accelerating Change in Medical Education" initiative since its inception. The AMA knew that funding projects and simply assuming those projects would be successful wasn't enough. The consortium needed a way to define success and needed to know what it looked like. It was vital to develop a plan that would allow the consortium to measure each project's cost-effectiveness and whether or not expected outcomes were attained.

To begin, every school was required to submit an individual evaluation plan as part of the application process to join the consortium. Later, once the consortium was up and running, it created a group evaluation plan, incorporating several key components. The goal of its evaluation plan was two-fold:

(1) Ensure learner readiness to succeed in our health care system

(2) Implement sustainable transformation in our medical education system

## ENSURING LEARNER READINESS

Evaluation of learner readiness included a knowledge examination to assess mastery of health systems science core content and shared standardized patient cases that measured system competencies.

The consortium collaborated with the National Board of Medical Examiners (NBME) to develop the first subject examination in health systems science. This exam was available to all consortium schools for no cost during the 2016/2017 and 2017/2018 academic years or until 7,000 exams were administered. Initial research using the examination showed students who had participated in health systems science relevant curriculum in medical school performed better on the examination than those who did not receive the innovative curriculum.

The subject examination is undergoing iterative development with the ultimate goal of serving as an assessment of content included in the consortium's *Health Systems Science* textbook. The initial 2.5 hour, 100-item exam covered patient safety, quality improvement, evidence-based medicine and teamwork. Social determinants of health and informatics were added for the 2017/2018 administration. The exam can be ordered through NBME like any other subject exam.

The standardized patient cases shared across schools included the following:

(1) **High-value cost-conscious care OSCE case by Mayo Clinic School of Medicine:** The student must participate in a high-value care discussion with a patient who has acute back pain with musculoskeletal features and is requesting spine imaging.

(2) **Interprofessional education OSCE case by Warren Alpert Medical School at Brown University:** The student must interact with a pharmacist by phone and a nurse in-person to discharge a patient with high blood sugar, a new insulin prescription and who needs insulin teaching.

(3) **Patient handover OSCE case by University of Chicago Pritzker School of Medicine:** The student must hand over three patients to a distracted resident.

The AMA also is working with the Accreditation Council for Graduate Medical Education (ACGME) to pilot a longitudinal research study to follow students who graduate from consortium member schools and measure milestones related to consortium innovations. Additionally, the AMA is working with the University of Utah to create a standardized program director survey that focuses on health systems science content and adapt the University of Utah's work in defining the value proposition for medical education to future evaluation plans.

## IMPLEMENTING SUSTAINABLE TRANSFORMATIONS

The AMA contracted with qualitative researchers from the University of Illinois, Chicago, on a project to help determine the sustainability of transformation within consortium medical schools. The project yielded positive results regarding:

- Successful implementation of innovation through different change management strategies
- Development of infrastructure to maintain the innovation after funding was completed
- Favorable reception of the innovative projects by educational and health system leaders
- The role of the AMA and the consortium in facilitating the success of the schools' projects

The consortium also has been closely tracking the dissemination of innovations developed at member schools to schools both within and outside of the consortium. This tracking includes noting as many points of contact as possible between consortium and non-consortium schools, ranging from initial conversations to full adoption of various innovations by other institutions. For example, five schools have

completed the "cost-conscious care" standardized patient case developed at the Mayo Clinic School of Medicine. Two are administering Brown's "interprofessional education OSCE" case and, as of July 31, 2017, eight institutions have adopted the Regenstrief EHR Clinical Learning Platform originally developed by Indiana University School of Medicine. Two schools have adopted the patient Room of Horrors from the University of Chicago Pritzker School of Medicine.

Member schools of the consortium have published dozens of papers listed in the annotated bibliography included in this monograph and made dozens of presentations at high-profile conferences. Hundreds of medical education leaders attend the consortium's biennial conference. Thousands of copies of the *Health Systems Science* textbook, which was written by consortium experts and published by Elsevier in 2016, have been sold around the world.

# Creating physician leaders

**Physicians need the skills to lead change that will shape the modern health care system.**

Reducing readmissions, improving safety and quality, implementing electronic health records and creating new health care delivery models[1]—these are some of the challenges health systems deal with every day. Physicians need leadership skills now more than ever in order to find solutions to these complex issues. While having physicians in executive or leadership roles within health care settings is nothing new, how these roles are created and defined has changed significantly. True physician leadership has become less about being at the top of the health care system hierarchy and more about being a collaborative leader who, with others, can help implement change in teams, effectively communicate at all levels, and be creative and effective in leading meaningful change across medicine.

The **University of California, San Francisco, School of Medicine (UCSF)**, the **University of Michigan Medical School (UofM)**, and **Dell Medical School at the University of Texas at Austin (DMS)** are three of the member schools of the AMA Accelerating Change in Medical Education Consortium whose projects include a significant focus on teaching medical students the skills they need to become physicians who are able to lead in multiple capacities.

## BUILDING A BRIDGE

**UCSF** joined the consortium in 2013. Its "Bridges Curriculum," a three-phase, fully integrated curriculum delivered over four years, launched in 2016 and is crafted to enable students to contribute to improving health care outcomes as they learn to work within complex systems and advance science for future generations of patients. All 21st century physicians, and especially physician leaders, need to be adept in inquiry—the ability to identify the limits of current knowledge, formulate key questions and apply research tool-based strategies for seeking answers. UCSF has students begin developing these inquiry skills during the first year of medical school through a case-based core inquiry curriculum in which facilitated small group sessions guide students in developing knowledge and skills in each of the domains of science and applying these skills to help solve important health care and scientific challenges. In addition, a two-week inquiry immersion block offers fundamental didactics, selective mini-courses and active team-based learning opportunities. In the final curriculum phase, students choose a domain of science in which to complete their deep inquiry, exploring scholarly work in partnership with a team of UCSF researchers.

UCSF is one of the consortium schools that has embraced the teaching of adaptive leadership as a core curricular component. Adaptive leadership is based on the concept of leading "the many by the many," rather than leadership of "the many by the few." Applied to medicine, leadership is seen as a complex dynamic, involving all those who participate within the care process. The theory calls for skills, attributes and roles that are additional to the demands of traditional leadership. In the Bridges Curriculum, after a classroom-based primer in health professions communication, interprofessional care and leadership, small teams of first-year medical students are embedded longitudinally in a clinical microsystem, which is defined as the combination of a small team of people who work together on a regular basis, or as needed, to provide care and the individuals who receive that care. The clinical microsystem experience provides situated, team-based medical student learning while those same medical students contribute to the microsystem's quality improvement work. Additionally, a robust longitudinal curriculum in practice-based learning and development, guided by a faculty coach, supports adaptive learning in all domains, including leadership.

## GRADUATING LEADERS

**UofM** joined the consortium in 2013 and has been transforming its curriculum ever since. The goal of UofM's revised curriculum is to graduate physician leaders who will improve health care at a patient and system level. Medical students are assigned to an M-Home learning community for their four years of medical school. They achieve competency in leadership through activities that are integrated with other core curricular components while developing change management experience in health care scholarly concentrations called "Paths of Excellence."

1 Elliott VS. Hospitals' new physician leaders: Doctors wear multiple medical hats. *American Medical News*. April 4, 2011. http://www.amednews.com/article/20110404/business/304049965/4/. Accessed June 7, 2017.

The program begins with medical students developing an understanding of their own values and capabilities and how a team's functioning is enhanced by the diversity of values and strengths that others bring to the table. Health care system experiences start on the first day of school. Medical students learn from other health professionals along with students from other health professions schools.

The UofM curriculum also includes tailored leadership coaching and participation in day-long exercises where students work together—using their own leadership traits—to design and propose solutions to health care problems and work on tasks toward a common goal. Students also participate in quarterly seminars and workshops that build their skills within each of the four leadership competency domains—teamwork, communication, problem solving and systems thinking—that were developed at UofM along with milestones for assessing the development of these skills. This developmental arc is tracked in a matrix portfolio that captures student progress in all aspects of the curriculum, co-curriculum and extra-curricular activities. In addition, UofM is measuring leadership development using an internally developed leadership inventory scale and 360-degree evaluations.

### LEADING A REVOLUTION

**DMS** joined the consortium in 2016. The mission of this new medical school, which matriculated its first class in 2016, is to revolutionize how people get and stay healthy by educating leaders who transform health care. To that end, the school is designing, implementing and evaluating a leadership curriculum through the principles of servant leadership, collaborative leadership and adaptive expertise. Servant leadership means serving takes priority over leading. Collaborative leadership is defined as leading across organizational and functional boundaries. Adaptive experts focus on accuracy, efficiency, innovation and creativity and have the attitude and aptitude to recognize the opportunity and necessity for invention. They appreciate their own knowledge, but also realize how little they know in comparison to all there is to know. They constantly question their own assumptions and feel comfortable doing so. They avoid strong emotional attachments to any set of beliefs.

The leadership curriculum at DMS is integrated in all four years of medical school. Students receive a core leadership curriculum, as well as the opportunity to pursue a leadership path created for each student based on his or her experiences and interests. In the third year of medical school—the innovation, leadership and discovery year—students have opportunities to pursue translational research, health care redesign, population health and basic science research, scholarship and dual degrees with a focus on leading change in their area of study. The opportunity to experience this unique curriculum will produce students with notable collaborative and adaptive leadership abilities and generative thinking skills that promote systems improvement.

# Creating an EHR designed for teaching

**With EHRs becoming standard in health care, medical schools are creating and using novel ways to incorporate informatics skills into the curriculum.**

Electronic health records (EHRs) have become ubiquitous. In 2004, 20.4 percent of all office-based physicians had an EHR. By 2015, this number increased to 86.9 percent.[1] In 2011, 71.9 percent of hospitals had a certified EHR. This number grew to 96 percent or nearly all hospitals in 2015.[2] Despite this, medical students frequently have inconsistent access to EHRs at clinical training sites and often do not receive specific instruction—beyond very basic software training—about using an EHR in practice.[3] This is like an architecture student learning how to design almost exclusively with paper, pencils, a drafting board, a T-square, a couple of plastic triangles and a compass—only receiving minimal instruction on computer-aided design (CAD) programs; then, being expected to expertly use CAD to its full potential on a daily basis once out in the workplace.

In order to address this gap in medical student preparation to practice in a modern health care system, **Indiana University School of Medicine (IUSM)**, a member of the AMA Accelerating Change in Medical Education Consortium, in conjunction with the Regenstrief Institute, developed the Regenstrief EHR Clinical Learning Platform. This EHR, designed specifically for teaching, is being incorporated into the curriculums at IUSM, the **University of Connecticut School of Medicine (UConn)** and **Sidney Kimmel Medical College at Thomas Jefferson University** (both of which are consortium member schools), as well as being adopted at additional non-consortium schools and institutions.

### CLONING AN EHR

**IUSM**, which joined the consortium in 2013, has created a teaching electronic medical record system (tEMR) that is a clone of an actual clinical EMR, using de-identified and misidentified real data on more than 10,000 patients.

1 Office of the National Coordinator for Health Information Technology. 'Office-based Physician Electronic Health Record Adoption,' Health IT Quick-Stat #50. dashboard.healthit.gov/quickstats/pages/physician-ehr-adoption-trends.php. December 2016. Accessed Aug. 4, 2017.

2 Henry, J., Pylypchuk, Y., Searcy T. & Patel V. (May 2016). *Adoption of Electronic Health Record Systems among U.S. Non-Federal Acute Care Hospitals: 2008-2015*. ONC Data Brief, no.35. Office of the National Coordinator for Health Information Technology: Washington DC.

3 Welcher CM, Hersh W, Takesue B, Elliott VS, Hawkins RE. Barriers to Medical Students' Electronic Health Record Access Can Impede Their Preparedness for Practice. *Academic Medicine*. http://journals.lww.com/academicmedicine/Abstract/publishahead/Barriers_to_Medical_Students__Electronic_Health.98156.aspx. Accessed July 28, 2017.

This tEMR allows medical students, starting in week one of medical school, to write notes and orders, view data on patients and access just-in-time information links. It provides a safe and realistic health system environment from which to learn and practice clinical decision-making skills and is a resource to address learning gaps and assist students in meeting competency-based expectations. Students work within a virtual health system and use the tEMR to identify errors and patient safety issues, initiate quality improvement and measure the success of these efforts, explore the potential for personalized medicine and gain comfort in comparing their own practice patterns with those of their peers.

Students "care" for a panel of e-patients and, blinded to the real care provided, have the ability to compare their diagnosis and treatment recommendations to those of their health student colleagues and to the actual attending provider, as well as experience firsthand the utility, power, versatility and challenges of using health information technology to deliver cost-effective, quality health care. Additionally, a cadre of 40 actors has been trained to simulate the e-patients included in the tEMR in specific health care scenarios for face-to-face learning encounters.

In April 2017, IUSM's tEMR was launched as the Regenstrief EHR Clinical Learning Platform and made more widely available to other medical schools, as well as institutions educating other health care professionals.

## EXPANDING THE EHR

**UConn** joined the consortium in 2016. It has incorporated the Regenstrief EHR Clinical Learning Platform into its new "MDelta" curriculum. In addition to plans to incorporate the EHR throughout all four years of medical school, UConn has expanded the IUSM registry of real de-identified and misidentified patients with its collection of virtual patients and families to further develop this learning platform. These patients and families are specifically configured for educational purposes with the capacity for clinical interaction over time, affording opportunities for virtual longitudinal care. This platform also allows educators to transition families to various points in time. So, the patient a student sees in year one of the curriculum at age 12 can be revisited as an adult in year four. Additionally, by anonymously rendering such a large number of cases, students are able to explore, review and research population health and health policy issues.

## INTEGRATING THE EHR INTO CURRICULUM

**Sidney Kimmel Medical College at Thomas Jefferson University** joined the consortium in 2016 and is in the process of integrating the Regenstrief EHR Clinical Learning Platform into its "JeffMD" curriculum and the Thomas Jefferson University Health Mentors Program. Jefferson's Health Mentors Program is an interprofessional health care delivery team educational experience that all Jefferson College of Medicine, College of Nursing, College of Pharmacy and College of Health Professions students participate in during their first two years. Jefferson is developing a pilot program using cases that pair patient data from the learning platform to new standardized patient cases. Students will be able to experience longitudinal care collected over a decade combined with short "live" encounters with standardized patients. The learning platform is used to teach students how to use an EHR for documenting patient medical history, develop and assess student history and physical exam skills, provide an educational extension of the standardized patient-training experiences, and create an opportunity to model best patient communication skills while using the EHR in the exam room.

# Taking advantage of technology to tackle health care's toughest problems

**Medical schools are identifying ways to use technology to address population health, cross communication barriers and increase access to care.**

Electronic health records are not the only technological innovation changing and enhancing the way physicians deliver quality care to patients. To improve population health and better participate in quality-based payment models,[1] practices are turning to population and system databases to learn more about the communities they serve. Physicians are using mobile technology in novel ways and are increasingly able to cross communication barriers in order to provide care.[2]

Telemedicine, a growing field across the country, is increasing access to health care, particularly in rural areas.[3]

**New York University School of Medicine (NYU)**, the **University of Texas Rio Grande Valley School of Medicine (UTRGV)**, and the **University of North Dakota School of Medicine and Health Sciences (UND)** are three member schools of the AMA Accelerating Change in Medical Education Consortium whose projects include a significant focus on incorporating various technological innovations into medical education in order to address some of medicine's longstanding challenges.

1 Diamond CC, Mostashari F, Shirky C. Collecting And Sharing Data For Population Health: A New Paradigm. *Health Affairs*. March/April 2009 vol. 28no.2 454-466.

2 Masland MD, Lou C, Snowden L. Use of Communication Technologies to Cost-Effectively Increase the Availability of Interpretation Services in Healthcare Settings. *Telemedicine Journal and E-Health*. 2010 Jul; 16(6):739–745.

3 Sood S, Mbarika V, Jugoo S, et al. What Is Telemedicine? A collection of 104 peer-reviewed perspectives and theoretical underpinnings. *Telemedicine Journal and E-Health*. 2007;13(5):573-590.

## HARNESSING BIG DATA

**NYU**, which joined the consortium in 2013, created "Health Care By the Numbers," a flexible, technology-enabled curriculum to train medical students in using big data—extremely large and complex data sets—to improve care coordination, health care quality and the health of populations. This three-year blended curriculum is founded on patient panel databases derived from de-identified data gathered from NYU Langone's outpatient physician practices and government-provided open data from the 2.5 million patients admitted each year to New York State hospitals. A total of over five million de-identified patient level records are available for student projects. Students can explore every inpatient admission by DRG code, providers, charges or hospitals. The data set is continually expanded and refined.

Medical students develop their skills in examining data across panels of patients, recognize the strengths and pitfalls of analyzing big clinical databases, and demonstrate an ability to work with large data sets to answer clinical questions and improve care quality. Medical students work in pairs to identify clinical hypotheses generated by the data set and wrestle with the questions associated with using big data, such as: Can a large retrospective N obviate the need for prospective sampling? When does the "messiness" of big data matter? When a correlation in a big data set is identified, how should it be investigated? The technology infrastructure for the NYU Health Care by the Numbers curriculum is open to the public at: http://ace.iime.cloud.

## COMMUNICATING THE MESSAGE

**UTRGV School of Medicine** joined the consortium in 2016. Its project incorporates tablet computers into a curriculum that aims to develop and implement educational models that nurture excellent communicators. These communicators ideally use technology to support, rather than impede, information exchange and empathetic interactions with individuals and diverse groups in multiple settings for numerous preventive health, health maintenance and health care delivery purposes. The students gain direct experiential interaction and learning within *colonias*, impoverished rural settlements in unincorporated areas along the U.S./Mexico border. Using tablet computers to gather information in the form of ethnographic-style field notes, students can include oral histories, statistics and other facts related to the health status and care needs of members of families. They also document experiences for use in projects that require interpretation and reflection.

For example, during one of the longitudinal curricular modules, students had the opportunity to shadow *promotoras*, bi-lingual (English and Spanish) specially trained lay health care workers as they made home visits and provided medical services. Students recorded their observations; then, they crafted a persuasive argument following the classic "Monroe Motivated Sequence" for action-oriented, audience-involved public speaking, to support hypothetical legislative funding for the development and implementation of *promotora* programs throughout South Texas.

These tablets also are used to capture audio and video recordings of interactions between and among medical students, as well as those studying other health professions. Students review the recordings and engage in faculty-guided narrative analyses. Future plans include the publication of e-books containing medical students' notes, analyses and reflections for formative feedback and program evaluation, as well as guidance for other students. This project has been approved by the institutional review board for research with human subjects.

## TELEMEDICINE, SIMULATION, RURAL AND REMOTE

**UND** joined the consortium in 2016 with a project incorporating advanced simulation and telemedicine into education about providing care to those in rural or remote communities. UND's simulation facility features multiple high-tech manikins and computer technology to simulate real-life patients. UND's project also incorporates Remotely Operated BiOmedical Telepresence Systems (ROBOTS) that can be used for telemedicine consults during simulations and for distance participation of students or faculty in telemedicine scenarios. These ROBOTS are computer tablets on pedestals that allow audiovisual and mobile participation from a desktop or laptop computer. Cases from UND's Simulation in Motion North Dakota (SIM-ND)—a statewide, mobile education system that uses high-fidelity human patient simulators to train prehospital and hospital personnel health care professionals and first responders using emergency cases commonly seen in rural settings—were modified for telemedicine and interprofessional education. To begin, a three-phase coronary artery disease scenario incorporating telemedicine consulting and continuity of care was created. Additional scenarios were identified around migraines, early-onset Alzheimer's dementia, atrial fibrillation/arrhythmia and COPD/pneumonia. These topics were chosen because they reflect common cases in rural settings, routinely require multiple professional disciplines and allow for the use of telemedicine components.

# Implementing health systems science—the emerging third pillar of medical education

**Medical students need to understand how the health system works in order to one day deliver effective care to patients.**

More than a century ago, the Flexnerian model[1] upon which American medical education is based established the requisite core study of basic sciences and clinical sciences. One of the earliest innovations to come from the AMA Accelerating Change in Medical Education Consortium was developed in response to the need for medical students to also learn about health systems. Health systems science, defined as the study of how health systems deliver care to patients and how patients receive and access that care,[2] emerged as a new and required third pillar of medical education and, with it, came new and innovative curriculum. Experts from consortium member schools wrote the *Health Systems Science* textbook, published by Elsevier in December 2016, and created a health systems science subject exam with the National Board of Medical Examiners. The textbook, standardized exam and related products in development support the incorporation of this important core content into the education of health care professionals and physicians at all levels of training.

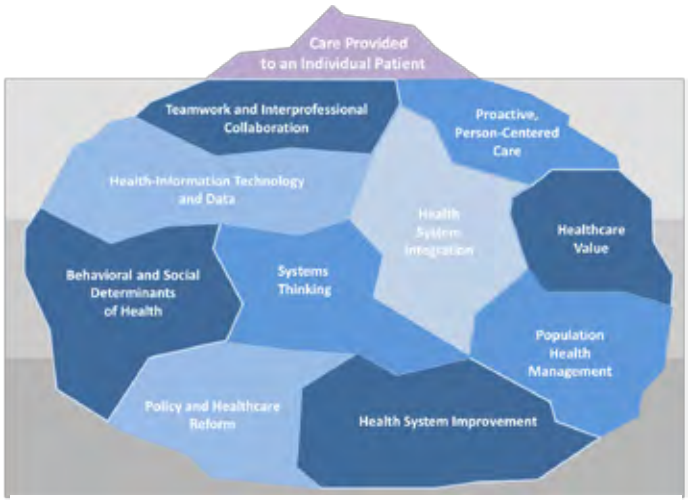
Several consortium member schools have incorporated health systems science as one of their core innovations, including **The Warren Alpert Medical School of Brown University**, **Mayo Clinic School of Medicine**, **The Brody School of Medicine (BSOM) at East Carolina University**, **Indiana University School of Medicine (IUSM)**, **University of California, San Francisco, School of Medicine (UCSF)**, **Vanderbilt University School of Medicine**, **Dell Medical School at the University of Texas at Austin (DMS)**, **Eastern Virginia Medical School (EVMS)**, and **A.T. Still University-School of Osteopathic Medicine in Arizona (ATSU-SOMA)**.

**Brown**, **Mayo Clinic**, **ECU**, **IUSM**, **UCSF** and **Vanderbilt** joined the consortium in 2013. **EVMS**, **ATSU-SOMA** and **DMS** joined the consortium in 2016.

## MASTERING HEALTH SYSTEMS SCIENCE

In order to teach medical students health systems science, **Brown** developed nine new courses that constitute the basis for a Master of Science degree in population medicine. Courses are integrated with basic and clinical science instruction and cover health systems, health policy, the role of law and policy in health disparities and social determinants of health, health safety nets, research methods in population medicine, leadership, quality improvement (QI), patient safety, the social and community context of health care, biostatistics and epidemiology. Portions of these courses are required for all medical students even if they do not also intend to complete the master's degree. Additionally, all students participate in the quality improvement/patient safety curriculum, as well as "race in medicine" curriculum.

Brown also has developed a longitudinal integrated clerkship to further students' understanding of health systems science. This clerkship encourages longitudinal relationships with patients and providers while at the same time encouraging students to explore the communities in which they work and learn. The clerkships are primarily based in the out-patient, rather than the hospital, setting and involve training in population medicine, social determinants of health, leadership and quality improvement.




**The "Iceberg" of Health Care Concepts Impacting Health**
Numerous factors and concepts are often underappreciated in the provider-patient interaction within a clinic room. Traditionally, these concepts have not been included in the scope of medical education.



## BLENDING HEALTH SYSTEMS SCIENCE

**Mayo Clinic School of Medicine** developed a four-year health systems science blended learning curriculum. More than half of this curriculum, including 50 of the course's 74 online modules, is delivered in a pair of two-week blocks in the first year. The curriculum consists of six content domains, including person-centered care, population-centered care, high-value care, team-based care, leadership and health policy, economics and technology. Students complete online modules before coming to the classroom or engaging in other learning activities. Activities in the first block include a multidisciplinary medical home team experience, a cultural humility workshop, emotional intelligence and personality inventories with debriefings, a day-in-the-life experience to learn

1 Duffy TP. *The Flexner Report—100 Years Later*. Yale Journal of Biology and Medicine. v.84(3); 2011 Sep https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3178858/. Accessed June 26, 2017.

2 Skochelak SE, Hawkins RE, Lawson LE, Starr SR, Borkan JM, Gonzalo JD. *Health Systems Science*. Philadelphia, PA., Elsevier. 2017.

how patients with socioeconomic challenges navigate the community to meet their health needs, health coaching skills practice and an introduction to population health. The block culminates in team peer teaching of health systems science topics of students' interest not presented during the block.

During the second block, students complete team global health projects on an assigned country, discuss measures of global health systems, as well as institutional quality measures and patient safety infrastructure with practice leaders, explore shared decision-making and minimally disruptive medicine, and complete a cross-cultural communication workshop with standardized patients. They learn essentials of community engagement from peer student teachers, an introduction to evidence-based medicine, biostatistics/epidemiology for clinical practice and QI methods and tools. The block finishes with presentations by student teams who use a patient case to link the block topics back to an individual patient's experience of health and health care.

Following Step 1 of USMLE and before entering their core clerkships, students complete additional online modules and two-and-a-half days of face-to-face instruction, including an introduction to high-value, cost-conscious care with an interactive session by a physician expert on an evidence-based approach to ordering tests. Students review clinical tools (both paper and electronic) that facilitate conversations with patients and guide them when ordering tests. Students also learn about patient handovers using I-PASS and complete a standardized patient scenario in which they disclose a medical error. Additionally, they participate in a shared decision-making role play session using a lung cancer screening decision aid.

Mid-year 3, students complete additional online modules and participate in a number of interactive classroom activities, including a panel discussion on incorporating shared decision-making and high-value, cost-conscious care, a proposal of a QI project, an analysis of a completed QI project, and exercises highlighting ways to mitigate individual and systems-based diagnostic errors. They complete an asynchronous "checkbook exercise" with a retrospective review of and reflection upon the costs of caring for a hospitalized patient they have seen in practice, and participate in a comprehensive interprofessional simulation exercise spanning various clinical settings in order to advance their teamwork and leadership skills. They practice their shared decision-making skills and high-value, cost-conscious care conversations with simulated patients and participate in a classroom exercise in which they analyze a systems error and use human factors, systems engineering and informatics lenses to suggest high-level interventions to prevent a future similar event. The school is identifying opportunities for students to reinforce and apply key health systems science skills during clerkships in order to move from in vitro learning to in vivo application.

## COMPREHENSIVE AND LONGITUDINAL

**BSOM** has established a comprehensive longitudinal core curriculum incorporating the Institute for Healthcare Improvement Open School Basic Certificate program throughout its curriculum. First-year students take courses on the fundamentals of improvement and introduction to patient safety. Second-year students receive instruction on population health, human factors that impact patient safety, quality, cost, value, teamwork and communication after adverse events. Several problem-based learning cases related to health systems science have been developed and incorporated into the curriculum during the first two years.

BSOM has been working with clerkship directors to identify activities that will enhance the clinical component of its longitudinal curriculum with respect to health systems science topics. The ob-gyn clerkship is incorporating the use of a fishbone diagram to identify systems issues for all third-year students. The psychiatry clerkship incorporates a case-based discussion on systems failures and barriers to care, which adds to the population health component of the longitudinal curriculum. The physical medicine and rehabilitation rotation for fourth-year medical students is incorporating team-based care experiences.

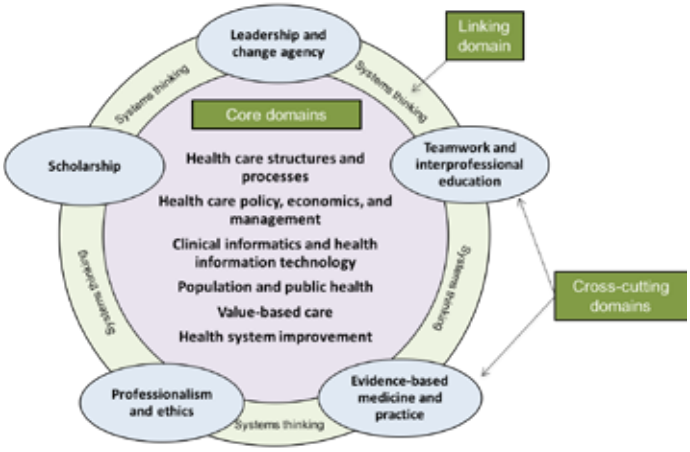
Building on patient safety and quality improvement activities introduced in the first three years of medical school, the "Transition to Residency Capstone Course" offers additional workshops on quality improvement methods and root cause analysis for reducing errors.

## VIRTUAL HEALTH SYSTEMS

**IUSM** has developed a novel virtual health systems curriculum framed by the structures, policies and evaluative mechanisms of its health system partners and grounded in a common e-patient panel accessed through the Regenstrief EHR Clinical Learning Platform.

One part of this curriculum is a unique course on health systems science for third-year medical students. It runs longitudinally along with the clerkships. Because third-year medical students are busy with clinical rotations and IUSM's medical students are dispersed throughout nine campuses in the state, the course has both virtual and face-to-face components. Two sessions are in-person small groups focusing on teamwork, accurate communication and diagnostic errors. They occur between clerkships. Four sessions are online and provide students the opportunity to develop a care plan for an older male with a new onset stroke and other comorbid conditions during different phases of care. During the first online session students review the patient's chart and identify social determinants of health, as well as barriers that might exist to effective care. The second online session involves planning the transfer of the patient to a rehabilitation facility and requires the investigation of health care costs, issues related to the safe transfer of the patient to another health care team, as well as how to communicate with the patient and family regarding his hospital and future care. The third online session focuses on outpatient medical errors and how to identify them, examine them through a root-cause analysis

and determine how to prevent such errors from recurring. The final online session focuses on issues related to palliative and end-of-life care. This program also looks at teamwork and interprofessional collaboration.

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## IMMERSIVE WORKPLACE EXPERIENCES

**UCSF**, as part of its "Bridges Curriculum," has designed, piloted, refined, implemented and evaluated longitudinal immersive workplace learning experiences for first- and second-year medical students that incorporate health systems science topics. Initial foundational courses in the Bridges Curriculum include sessions on health systems science. Medical students also become part of system-improvement teams and participate in clinical microsystems clerkships. Each student is assigned to a microsystem for the first year. At the outset, students focus on understanding and improving the patient experience as a member of the microsystem's clinical care team. After they have proven their ability to address the needs of the patient and the care delivery teams, they begin to integrate their systems work with their education in direct patient care skills.

Examples of student projects that have improved the patient experience include those that involve students providing geriatric patients personalized strategies to optimize function and physiology before surgery. Women in a safety-net clinic have received personalized counseling about their mammogram decisions. Medical students also have worked on projects that reduce the time to hormone initiation for transgender veterans, decrease rates of surgical site infections, lower the number of patients leaving the emergency department without being seen, and have created a systematized approach for handoffs between the pediatric operating room and the pediatric acute care unit.

## BUILDING A FOUNDATION

Medical students at **Vanderbilt** take part in "Foundations of Health Care Delivery," a longitudinal four-year course that embeds students into care delivery systems. First-year students have a continuity clinical experience and participate in seminars on key health systems science topics, including team-based care, patient safety, high-value care, and social determinants of health. During core clinical rotations, students have longitudinal sessions focused on transitions of care, delivery of high-value care and choosing the most appropriate setting of care. Third- and fourth-year medical students complete largely self-directed modules on advanced topics in health systems science, including cultural competency, quality improvement, patient safety, clinical microsystem analysis, building a quality improvement team, sustaining clinical change, interprofessional education, effective team building, interprofessional care plans, team communication, advanced population health, health care policy, health care economics and public health.

Students are expected to demonstrate an understanding of the different care settings that comprise an integrated health care system, including self-care, community care, outpatient primary and specialty care, urgent and emergent care, inpatient episodic care (including operative and critical care), rehabilitative care, long-term care and palliative care. The Foundations of Healthcare Delivery activities during all phases are deliberately designed to highlight differences and commonalities among care settings.

## EMBEDDED IN ALL FOUR YEARS

**DMS** has created a health care value curriculum as part of its work in health systems science that is embedded in all four years of medical school. Students participate in introductory sessions during year one. For year two, the value curriculum is delivered through online modules embedded within clerkship intersessions. Value also is incorporated into the students' clerkship notes and into projects that are part of the "innovation, leadership and discovery" block during the third year. Value improvement activities take place in the fourth year.

## CASE-BASED AND INTEGRATED

**EVMS** implemented its new "CareForward" curriculum in 2016. This curriculum teaches health systems science, along with basic and clinical sciences, through a case-based, integrated approach using a virtual community of culturally diverse families and associated electronic health records. The virtual families are woven together by stories that bring clinical scenarios to life and highlight patient- and family-centered, cost-conscious care for the unique needs of the elderly and those with multiple chronic conditions, as well as a host of social determinants of health. Families are designed to be diverse with regard to age, gender, sexual orientation, ethnicity, race, culture, belief system, literacy level, socioeconomic status and geography. Variables introduced include veteran affairs, family dynamics, financial turbulence, health equity/disparity, roles within a care delivery team, access to community resources, interactions of organizations and complexities of care in specific patient populations.

Students are given specific cases and asked to work with their team to develop a person-centered approach to care, taking the social and health behavioral factors into account. Organ

system modules and clerkships use longitudinal clinical cases drawn from the virtual families. Where appropriate, these cases are brought to life through interprofessional patient panels. In the context of the cases, the students have an opportunity to interact and learn from multiple professionals, including lawyers, architects, patient navigators, social workers and hypertension coaches.

### PARTNERSHIPS WITH THE COMMUNITY

**ATSU-SOMA** has a partnership with the National Association of Community Health Centers that allows its second-, third- and fourth-year medical students to be embedded at 12 rural and urban community health centers for contextual learning about health systems science along with the basic and clinical sciences.

As part of a year-long course in epidemiology, biostatistics and preventive medicine, second-year students conduct needs assessments and work with community health center leadership and community stakeholders to perform community-based research, quality improvement or service projects that recognize the local, social and economic determinants of health. Within the framework of community-oriented primary care, students are encouraged to work on projects addressing issues that local leaders and community members consider important, and student teams compete for the privilege of presenting the results of their community project at a national conference of community health center providers and leaders.

Patient panels include a wide array of vulnerable populations, including rural Appalachian farmers, ethnic groups in the low-country of South Carolina, isolated American Indians, Hawaiian natives, urban homeless, émigrés, those with HIV and others.

## What is the true cost of medical education?

**Quantifying the cost and worth of aspects of medical education can lead to lower expenditures and increased value.**

Health care payment is moving away from volume-based reimbursement to a system that prioritizes value.[1] In the wake of this trend, assessing and managing cost and value in health professions education is critical. Debt for medical school graduates has risen faster than inflation over the last 20 years.[2] In addition to the increasing cost of student tuition, the total cost of medical student education is rising even faster.[3]

The **University of Utah School of Medicine**, which became a member of the AMA Accelerating Change in Medical Education Consortium in 2016, is adapting tools developed by the University of Utah Health Sciences Center that have proven effective at bending the cost curve of health care to create a new educational model that emphasizes cost reduction and improves educational outcomes.

Beginning in 2012 the University of Utah Health Sciences Center began a project to develop a framework for understanding and improving health care value. "Value Driven Outcomes" (VDO) is a tool that aggregates data and organizes it into professional direct costs and facility direct costs. Data is aggregated in the University's data warehouse where it is then available for analysis and modeling. This resource allows decision makers to evaluate specific elements of care delivery, such as the incremental cost of each minute in the operating room. All of these costs are then linked to patient outcomes allowing for standardization of care that has the potential to both lower costs and improve patient outcomes. Adapting the VDO tool for undergraduate medical education provides new ways to understand the real costs of innovative, education strategies at Utah and other consortium member schools and helps define the best value in medical education.

## Creating learning opportunities that add value to the health system

**Medical students are increasingly becoming part of health care teams and contributing in ways that benefit patients.**

As part of the consortium's ongoing efforts to incorporate health systems science more fully into medical education, medical students are becoming part of interprofessional teams providing health care, but not as passive observers. These students are filling experiential roles that benefit their education, patients and the team as a whole. Together, team members from multiple disciplines provide care. Medical students within these teams work at a level appropriate to their

1 Skochelak SE, Hawkins RE, Lawson LE, Starr SR, Borkan JM, Gonzalo JD. *Health Systems Science*. Philadelphia, PA., Elsevier. 2017

2 Fresne J, Youngclaus J, Shick M. *Medical Student Education: Debt, Costs, and Loan Repayment Fact Card*. In Colleges AoAM, (Ed) 2014.

3 Cooke M, Irby DM, O'Brien BC. *Educating physicians: A call for reform of medical school and residency*: John Wiley & Sons 2010.

educational attainment.[1, 2, 3] Students also complete quality improvement projects that provide tangible benefits.

**Penn State College of Medicine**, **University of Michigan Medical School (UofM)**, **University of California, San Francisco, School of Medicine (UCSF)**, **Case Western Reserve University School of Medicine (CWRU)**, **Rutgers Robert Wood Johnson Medical School** and the **University of North Carolina School of Medicine (UNC)** are some of the member schools of the AMA Accelerating Change in Medical Education Consortium that are creating value-added roles for medical students.

## PATIENT NAVIGATORS AT WORK

**Penn State** joined the consortium in 2013 and launched its "Systems Navigation Curriculum," or SyNC, in August 2014. SyNC combines a course in the science of health systems with an immersive experience as a patient navigator.

The patient navigation aspect is a nine-month experience in which students are immersed in a clinical site or program. Student navigators guide patients through the complex health continuum, assist in implementing a new initiative or serve as an extension to the clinical staff. Student navigators provide information, educate patients, offer emotional support and facilitate coordination of community care. They are embedded in transitional care programs, primary care clinics, specialty-based clinics, underserved free clinics and nursing homes.

Medical students apply their patient navigator experiences along with their classroom learning in health systems science to create health care systems improvement plans and patient narratives that reflect mindfulness, multiple perspectives, the evolving role of the physician, the changing place of teams and a clear sense of agency.

## MODIFYING THE MODEL

**CWRU** joined the consortium in 2016 and modified **Penn State's** patient-navigator model to work with specific populations and focus more on care coordination. Medical students become part of interprofessional teams at one of two high-performing patient-centered medical homes (VA Center of Excellence in Primary Care Education and Neighborhood Family Practice, a federally qualified community health center). These care sites serve veterans and newly arrived refugee families, and each team manages and assesses the needs of a panel of 20 patients within each practice.

Navigators perform a variety of functions as critical members of the health care team leading to increased health system knowledge and positive impact on the team and patient.

Navigators also work with the electronic health record (EHR) systems at their sites and receive targeted trainings around EHR navigation and the creation and use of registries for population health management in specific populations (veterans and newly arrived refugees).

## ACCOUNTING FOR CARE

**Rutgers Robert Wood Johnson Medical School** joined the consortium in 2016 and is incorporating medical students and other health-profession learners into care coordination teams at the Robert Wood Johnson Partners Accountable Care Organization (ACO). There are 35,000 patients in the ACO receiving care in one of the most racially/ethnically diverse states in the nation.

In addition to medical students, these teams include those from the nursing, pharmacy, physician assistant and social work schools. Teams augment care for patients with multiple chronic conditions and maximize integrated care delivery in the home setting. Medical students are coached by and collaborate with the existing care coordination teams and learn new models of health care delivery on a personal basis in patients' homes, along with the complexities of managing patients with multiple chronic conditions.

These teams of learners conduct at-home health literacy assessments, elicit patients' explanatory models of health and illness, explore and discuss the psychosocial impact of illness on functional status and related coping strategies, and conduct home safety assessments. They also perform medication reconciliations, assess patients' understanding of and adherence to medication regimens, perform motivational interviewing for preventive health measures and assess medication adherence. Additionally, teams determine patients' participation in self-care, measure patient health confidence and self-care habits, participate in collaborative care team meetings and develop interdisciplinary care management plans. Medical students communicate with other members of the team, care managers, clinicians and others electronically, by phone and in the EHR to ensure active participation in patient care, transmission of care plans, and transitions of care within the team and between the team, care coordinators and clinicians.

Medical students record data on selected quality metrics, elicit patients' experience of care, health confidence and satisfaction, and strategize reasons for performance on ACO quality measures. They also propose quality improvement projects for metrics with suboptimal performance that can be carried out using a PDSA (Plan, Do, Study Act) format.

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1 Gonzalo JD, Thompson BM, Haidet P, Mann K, Wolpaw DR. A Constructive Reframing of Student Roles and Systems Learning in Medical Education Using a Communities of Practice Lens. *Academic Medicine*. 2017 Jun 20. PMID: 28640036.

2 Gonzalo JD, Lucey C, Wolpaw T, Chang A. Value-Added Clinical Systems Learning Roles for Medical Students That Transform Education and Health: A Guide for Building Partnerships Between Medical Schools and Health Systems. *Academic Medicine*. 2017 May; 92(5):602-607. PMID: 27580433.

3 Gonzalo JD, Dekhtyar M, Hawkins RE, Wolpaw DR. How Can Medical Students Add Value? Identifying Roles, Barriers, and Strategies to Advance the Value of Undergraduate Medical Education to Patient Care and the Health System. *Academic Medicine*. 2017 Mar 28. PMID: 28353500.

## PATHS OF EXCELLENCE

**UofM** joined the consortium in 2013. As part of its overall curriculum, students add value to the health systems in which they are learning by way of high-yield capstone projects completed through UofM's "IMPACT" and "Paths of Excellence" programs. These projects are designed to impact global health and disparities and are as diverse as the students' interests. Some examples include creating a community health agent-led diabetes self-management program using motivational interviewing-based approaches in a public primary care center in São Paulo, Brazil; comparing the syndromic approach of sexually transmitted infections to point-of-care testing at a U.S. hospital; analyzing predictors of photographic quality with a handheld non-mydriatic fundus camera; and assessing indications and outcomes of cesarean section procedures in Meru, Kenya. Ethics projects have tackled revising the Michigan policy on advance directives and the ethics of anatomical donation. Health policy projects have focused on maternal deaths in Michigan due to hemorrhage and strategies for new skill acquisition by practicing surgeons.

UofM students have also added value to academia by launching the *Michigan Journal of Medicine*, a peer-reviewed, student-led forum that publishes scientific and clinical research generated by UofM students. Medical students in the curriculum's professional development branch program occupy all editorial leadership roles and supply all content. Journal editorial work is conducted under the guidance of UofM medical school faculty, many of whom also serve as editors for prestigious international journals.

## MAKING A CONTRIBUTION

**UCSF** joined the consortium in 2013. Its "Bridges Curriculum" launched in 2016 and is designed to enable students to contribute to improving health care outcomes as they learn to work within complex systems. Learners are immersed in a longitudinal, interprofessional and authentic clinical microsystem and play a role in improving patient experience and health care quality while learning and applying clinical skills.

At the outset, students focus on understanding and improving the patient experience as a member of the microsystem's clinical care team. After they have proven their ability to address the needs of the patient and the care delivery teams, they begin to integrate their systems work with their education in direct patient care skills.

Since the launch of this curriculum, medical students have contributed to dozens of effective quality improvement initiatives across three health systems.

## IMPROVING QUALITY AND ADDING VALUE

**UNC** joined the consortium in 2016 and implemented its student-centered and patient-based integrated, modern curriculum, "Translational Education at Carolina." All students are trained to add value to the clinical care environment. This means students are instructed in quality improvement techniques focused on specific common clinical problems such as diabetes, cancer screening and vaccinations. They also complete quality improvement projects that benefit the clinics where they train.

During the 16-week primary care rotation students complete a meaningful quality improvement project that is part of their clerkship grade. Students set both process and outcomes measures for all projects, and the majority have been able to document improvements. Examples of successful projects include those that increased the percentage of patients with diabetes who are on daily aspirin and decreased the proportion of patients who fall away from care. Other projects have involved medical students recognizing that diabetic foot exams were not being properly recorded in the EHR and teaching proper documentation to other providers. This project improved care and the clinic's billings.

In part because of these projects, practices teaching clerkship students have had higher improvement scores in collaborative efforts on colon, breast and cervical cancer screening rates compared to clinics that did not have medical students.

# Embedding students in communities

**Medical students are becoming part of the communities where they train.**

By working longitudinally within large health systems, neighborhoods, community health centers and even households, medical students are gaining hands-on experience that changes both how and where they ultimately practice medicine.[1] These experiences span one to four years and provide opportunities for medical students to learn about social determinants of health, population management, chronic disease management, quality improvement, patient safety, team-based care, preventive health skills and other facets of health systems science. Because these experiences take place over a long period of time, they improve continuity of care and allow medical students to develop future practice bonds and form deeply rooted connections to the local community. This has resulted in a greater number of students who become primary care physicians or choose other specialties that are in short supply.

1 Henry TA. Medical students get first-hand experience with underserved patients. *AMA Wire*. Aug. 11, 2016. https://wire.ama-assn.org/education/medical-students-get-first-hand-experience-underserved-patients. Accessed July 28, 2017.

## BECOMING PART OF A LARGE HEALTH SYSTEM

**The University of California, Davis, School of Medicine (UC Davis)** joined the AMA Accelerating Change in Medical Education Consortium in 2013 and established a model three-year education track, the "Davis Accelerated Competency-based Education in Primary Care" (ACE-PC) program. This medical school implemented it in close collaboration with Kaiser Permanente of Northern California, the largest health care provider in the region.

UC Davis medical students who are accepted into the ACE-PC program start school six weeks earlier than traditional students and complete a pre-matriculation course that prepares them to begin supervised work in a primary care clinic starting in the first week of medical school. They are then embedded into Kaiser Permanente's integrated health care delivery system and patient-centered medical home model. Each student works with a dedicated Kaiser clinician who acts as a mentor and coach and translates classroom learning into everyday clinical practice skills. The program uses entrustable professional activities (EPAs) to assess competence, emphasizing health systems science and practice-based learning and improvement. It addresses pressing societal needs by including work with medically underserved populations and a robust commitment to enhancing workforce diversity. The partnership with Kaiser allows medical students to learn population management, chronic disease management, quality improvement, patient safety, team-based care and preventive health skills within state-of-the-art ambulatory facilities.

Lessons and innovations from the ACE-PC program are being applied to the broader medical school curriculum.

## MOVING INTO A PATIENT-CENTERED MEDICAL HOME

**Ohio University Heritage College of Osteopathic Medicine** joined the consortium in 2016 and launched a new osteopathic medical education curriculum, "Value-Based Care," which is an innovative, competency-based program integrating primary care delivery and medical education. Concurrent with academic classes, students are embedded within a patient-centered medical home operated by the Cleveland Clinic in order to promote a seamless continuum between undergraduate medical education, graduate medical education and clinical practice.

This continuous, longitudinal curriculum progressively helps students develop the skills needed to lead in health systems science, population health, communications, health care team leadership, patient safety, health information technology and traditional aspects of patient care. Students develop resilience practicing in an underserved and often resource-limited setting.

This medical school is also working to create longitudinal experiences for medical students to provide health coaching services to the local community.

## WORKING AT COMMUNITY HEALTH CENTERS AROUND THE COUNTRY

**A.T. Still University-School of Osteopathic Medicine in Arizona (ATSU-SOMA)** joined the consortium in 2016 and works in partnership with the National Association of Community Health Centers to embed medical students in 12 urban and rural community federally qualified health centers across the country during their second, third and fourth years of medical school. Students live in the community and work with providers dedicated to serving underserved patients and whole communities developing a fuller perspective of the challenges patients experience when trying to access health care services.

Each community campus has dedicated and fully equipped classroom space for didactic instruction, training in osteopathic principles and practice, and clinical skills application. Patient panels include a wide array of vulnerable populations, including rural Appalachian farmers, ethnic groups in the low-country of South Carolina, isolated American Indians, Hawaiian natives, urban homeless, émigrés, those with HIV and others.

Students also have the opportunity to develop and complete a community-oriented primary care project. They identify needs, evaluate them and develop strategies for implementing change. They then compete for the privilege of presenting their community project results at a national conference of community health centers.

## COMMUNITY HEALTH CENTERS IN NEW YORK

**CUNY School of Medicine** joined the consortium in 2016—its students are embedded at numerous federally-qualified health centers in New York City. Students enter a seven-year BS/MD program that prepares them to become primary care physicians in medically underserved areas. Students are embedded in the health centers for three years, beginning in the third year of the seven-year program.

During the first year of being embedded, students shadow physician preceptors and develop their clinical history-taking skills. They also learn about team-based care and rotate with nurses, dieticians and social workers in order to understand how each professional contributes to patient care. Medical students are trained as health coaches and begin to meet with patients in that role, helping them identify health-related behavioral changes, such as exercise and diet changes. They follow up with those patients longitudinally.

Students return to the same health centers during the following two years of their longitudinal clinical experience and assist with value-added tasks, such as medication reconciliation and developing and disseminating patient education tools. Students act as navigators accompanying patients through all points of their clinic visit and begin to identify the multiple points of care, the various members of a health team and their specific roles, ranging from the front desk, to nursing/triage staff, the physician, pharmacists, social workers and

nutritionists. Medical students also assist the medical team in keeping track of quality measures for the patients (such as the patient's HEDIS measures) and helping the clinicians identify and address any outstanding issues to help improve these measures.

### ON THE BORDER

**University of Texas Rio Grande Valley School of Medicine (UTRGV)** joined the consortium and matriculated its first class in 2016. Curricular content and experiences throughout the four years incorporate information and approaches that have particular relevance to working with underserved populations.

Students have opportunities to participate in preceptorships in family medicine clinics and engage in clinical operations that serve *colonias*, impoverished rural settlements in unincorporated areas along the U.S./Mexico border. Most *colonia* residents were born in the United States and are under 18. The border region where UTRGV School of Medicine is located struggles with issues related to immigration, significant poverty and a lack of access to quality, affordable health care for much of the population. This area is designated as one of the most medically underserved regions in the United States.

Students collaborate with interprofessional teams that work alongside community partners to provide integrated care and to connect patients with behavioral health and other resources. Medical students also participate in community outreach activities, such as giving supervised flu shots.

### IN THE NEIGHBORHOOD

**Florida International University Herbert Wertheim College of Medicine (FIU HWCOM)** joined the consortium in 2016 and built upon its "Green Family Foundation Neighborhood Health Education Learning Program" (NeighborhoodHELP™). This program focuses on the social and behavioral determinants of health to provide a longitudinal, interprofessional community-based experience for medical students. In the first year of medical school, students are introduced to the school's community outreach team, which has relationships with more than 160 community partners.

Each student is assigned to an interprofessional team comprised of FIU students from nursing, social work and/or physician assistant studies. These teams are each assigned an underserved household to take care of household members. Students learn cultural competence interprofessional communication and collaboration, application of motivational interviewing skills and an understanding of the social and behavioral determinants of health as part of household-centered care, defined as identifying and helping to manage the social determinants that can improve the health outcomes of members of a household. Faculty from the medical school, as well as other health professions education schools, participate in the household visits, and law and education faculty and students are available by referral. After the first two years of NeighborhoodHELP, household surveys indicated that visits by outreach workers or student teams resulted in increased use of preventive health services and a trend toward decreasing the use of the emergency department as a regular place of care. The program also allows for collaboration with local hospitals to improve population health outcomes.

This medical school also has incorporated mobile health centers for the delivery of integrated primary and behavioral health services and 3D mammography screenings for participating household members. These centers facilitate access to care for uninsured and underinsured household members.

## Patient safety and quality improvement: Integral skills for all health care providers

**Patient safety and quality improvement are skills that can be taught and learned in medical school.**

Patient safety and quality improvement are two of the core topics within health systems science. Several member schools of the AMA Accelerating Change in Medical Education Consortium have implemented curricular changes to ensure medical students are capable in both. Patient safety first emerged as an important area of study in the wake of the 1999 landmark Institute of Medicine report, "To Err is Human: Building a Safer Healthcare System." Improving patient safety requires understanding the system factors that lead to error and potential patient harm. Similarly, quality improvement, a closely connected topic, involves learning quality improvement methods, as well as the most common challenges to achieving quality.

**The University of Chicago Pritzker School of Medicine**, **Michigan State University College of Osteopathic Medicine**, **Emory University School of Medicine**, **Mayo Clinic School of Medicine** and **Vanderbilt University School of Medicine** are some of the consortium schools that have incorporated quality improvement and patient safety into their curricular transformations.

### WELCOME TO THE "ROOM OF HORRORS"

The **University of Chicago Pritzker School of Medicine** joined the consortium in 2016 and then launched its VISTA—Value, Improvement, Safety and Team Advocacy—curriculum. "VISTA" incorporates active learning in patent safety and health care quality into all four years of medical school and uses novel technological tools to do so. These tools include

an online microblogging learning community with trained faculty coaches, point-of-care applications on mobile devices and a "Room of Horrors" filled with some of the scariest hazards to patient care. Horrors presented include no available hand hygiene, lowered bed rails (fall risk), patients with undocumented latex and medication allergies, the wrong name linked to the wrong patient, no isolation precautions, the wrong medication for the wrong patient, no venous thromboembolism prophylaxis, unnecessary restraints, unnecessary Foley catheters, unnecessary blood transfusions and unnecessary stress ulcer prophylaxis.

Students also participate in small group exercises to brainstorm improvement projects using measures from the Centers for Medicare and Medicaid Services' "Hospital Compare" database.

## FIRST DO NO HARM

**Michigan State University College of Osteopathic Medicine** joined the consortium in 2016 and launched its "First, Do No Harm" curriculum. This incorporates patient safety concepts longitudinally across undergraduate and graduate medical education. Planned learning activities begin in year one of medical school, continue during clerkship and culminate with synthesis level projects in the first year of residency. The Institute for Healthcare Improvement's Open School patient safety online modules are combined with newly developed case scenarios from this college and presented across 24 hospitals to over 300 students using an interactive learning and assessment platform coupled with onsite faculty to guide learning and practice. Evaluation includes pre/post assessment of content retention, trainee self-assessment of competency regarding patient safety tools and longitudinal measurement of behavioral change among residents based on supervisor feedback.

## ACROSS THE CONTINUUM

**Emory University School of Medicine** joined the consortium in 2016. It has standardized instruction on quality improvement and patient safety across Emory's medical education continuum, which includes all of Emory's medical students, residents, fellows, faculty, affiliated physicians and interprofessional colleagues. As part of this standardization, a set of related milestones for medical school, graduate medical education and practicing physicians has been created. Emory also has created a database of past and current quality improvement activities in order to promote collaboration. Content has been incorporated into all four years of medical school and has been designed to match the stage of training. All incoming residents and fellows are required to complete a group of modules through the Institute for Healthcare Improvement's Open School online curriculum, so they have a base of quality improvement and patient safety knowledge. Emory also created a faculty development course that requires faculty members to bring a trainee and an interprofessional partner to the learning process. This has helped smaller graduate medical education programs at Emory to develop faculty expertise and in training their residents or fellows.

## PASSING ON I-PASS

**Mayo Clinic** joined the consortium in 2013 and uses a blended learning approach (completion of online modules prior to classroom and simulation activities) for the majority of its quality and safety curriculum. Eight modules are specific to quality improvement and patient safety. In the first year students learn about safety culture, quality measures, classification and reporting of patient safety events, as well as quality improvement methods and tools. After USMLE Step 1 and before core clerkships, students learn how to participate in effective patient handovers by using the I-PASS mnemonic. They also practice disclosing medical errors to standardized patients. Mid-third year, students propose and evaluate clinical quality improvement projects and participate in comprehensive interprofessional team-based care simulated clinical scenarios. They participate in a classroom activity where they learn how to mitigate diagnostic errors and analyze a systems-based error using human factors, systems engineering and informatics lenses to suggest high-level interventions to prevent similar events.

## PLANNING, DOING, STUDYING, ACTING

**Vanderbilt** joined the consortium in 2013. First- and second-year students participate in monthly seminars on patient safety and quality improvement, along with other relevant subjects, as part of "Foundations of Health Care Delivery," a longitudinal four-year course that embeds students into care delivery systems. Third- and fourth-year medical students complete largely self-directed modules on advanced topics in patient safety and the building of a quality improvement team. Quality improvement projects completed by students include those that have improved hand sanitation among health care workers, increased compliance with safety regulations governing the use of portable x-ray machines, and standardized the workflow of social work services in need-based clinics. All students are required to complete two plan-do-study-act (PDSA) cycles as a part of their project.

# Developing faculty to teach patient safety and quality improvement

**Those who teach medical students also need to learn new topics and skills.**

Before medical students can be taught the competencies associated with patient safety and quality improvement, medical school faculty must learn how to teach these relatively new areas of focus in medicine. Efforts to incorporate patient safety and quality improvement into the curriculum of medical schools have been hampered by a lack of faculty who are knowledgeable in these emerging areas of medicine.[1] **Brody School of Medicine (BSOM)** at **East Carolina University (ECU)** and **Emory University School of Medicine** are two of the member schools of the AMA Accelerating Change in Medical Education that are emphasizing faculty development in patient safety and quality improvement.

## A TEACHER OF QUALITY ACADEMY

**BSOM**, which joined the consortium in 2013, designed and created its Teachers of Quality Academy (TQA). This was launched in 2014. Participants are drawn from Brody's clinical faculty, as well as from ECU's Colleges of Nursing and Allied Health, and from the school's affiliated health system, Vidant Health. Those who have graduated from the program have become a cohort of master educators on patient safety and quality improvement and have helped advance these subjects across the campus and health system.

Before beginning the TQA program, faculty complete baseline assessments, as well as the Institute for Healthcare Improvement's "Basic Certificate in Safety and Improvement." Instruction uses a "flipped classroom" model rather than relying solely on didactic instruction. In addition to receiving instruction in patient safety and quality improvement principles, TQA faculty develop and conduct a clinical quality improvement project over the course of the year-long training and receive mentoring and peer support throughout the process. TQA faculty also participates in the "TeamSTEPPS" training from the Agency for Healthcare Research and Quality.

BSOM also has created a three-course credential in medical education, sponsored by ECU's College of Education, which is tailored to meet the needs of clinical educators. These courses provide TQA faculty with training in adult education principles, curriculum development, teaching modalities and assessment methods in order to ensure effective planning, delivery and evaluation of the newly designed curriculum. A curriculum development requirement accompanies this portion of the training, which is focused on the use of simulation exercises, OSCEs, standardized patients and gaming, as well as small group case-, team- and problem-based discussion techniques. Required coursework for the credential program may be applied towards a certificate program or a master's degree in education.

TQA graduates have substantially contributed to a number of improvements in health system processes and clinical outcomes and have been heavily involved in creating the longitudinal health system science curriculum for medical students. Several have assumed major clinical or educational leadership roles. TQA work can be incorporated into consideration of faculty promotion and tenure review.

## EXPLORING THREE OPTIONS

**Emory**, which joined the consortium in 2016, has implemented a faculty development program around patient safety and quality improvement that offers three options. One is a two-day introduction to quality and safety that is open to all faculty and focuses on terminology, concepts, methods and culture of safety. Another is an intensive semester-length course with a project designed to develop people who can be independent practitioners and leaders of quality improvement initiatives. For the third option, approximately 20 Emory faculty members per year from the medical school, as well as 30 from other health professions schools, participate in project-based teaching of quality improvement methods and patient safety principles. The course employs a small group experiential learning format over six months. Teams are assigned an experienced quality improvement coach. Final project posters are submitted to a campus-wide health sciences quality conference.

Additionally, Emory became a portfolio sponsor for the American Board of Medical Specialties. This allows quality improvement training and related projects to meet maintenance of certification (MOC) requirements. Emory also is working to improve its website to allow for online submission and management of these projects.

1 Headrick LA, Barton AJ, Ogrinc G, et al. Results Of An Effort To Integrate Quality And Safety Into Medical And Nursing School Curricula And Foster Joint Learning. *Health Affairs*. December 2012. Vol. 31. No. 12 2669-2680. http://content.healthaffairs.org/content/31/12/2669.full. Accessed July 19, 2017.

# Teaching medical students to work as members of a health care team

**Providing excellent patient care frequently means working with other medical professionals throughout the health care system.**

The Institute of Medicine recommended in 2003 that "all health professionals should be educated to deliver patient-centered care as members of an interdisciplinary team."[1] Since then, a growing number of medical schools have been incorporating interprofessional education into the curriculum. The Interprofessional Education Collaborative, which is co-sponsored by the Association of American Medical Colleges along with other health professional education organizations, issued a report outlining the core competencies for interprofessional education (IPE) in 2011.[2]

In order to address ongoing challenges and to more fully incorporate IPE into medical school curriculums, several member schools of the AMA Accelerating Change in Medical Education Consortium are focused on this growing area. These schools, all of which joined the consortium in 2016, include the **University of Nebraska Medical Center (UNMC) College of Medicine**, **Florida International University Herbert Wertheim College of Medicine (FIU HWCOM)**, **University of North Dakota School of Medicine and Health Sciences (UND)**, **Emory University School of Medicine**, **Case Western Reserve University School of Medicine (CWRU)**, **CUNY School of Medicine**, **Rutgers Robert Wood Johnson Medical School**, and **University of Connecticut School of Medicine (UConn)**.

## DEVELOPING ASSESSMENTS FOR INTERPROFESSIONAL PRACTICE

**UNMC** is working to move IPE beyond the traditional classroom setting and into clinical training environments where it can be applied for the benefit of patients and populations. As part of this effort, UNMC's College of Medicine has partnered with the colleges of nursing, public health, pharmacy, dentistry and allied health professions, as well as Nebraska Medicine, an affiliated health system, to identify accreditation standards regarding IPE for each training program and complete a needs assessment and inventory of necessary and ongoing activities. UNMC also has created an institution-wide assessment tool for use in measuring student competence in working within interprofessional teams.

This resource, the "SAW-IT Assessment Tool," is available as a mobile app and includes questions about the level of collaboration among the care team, including the patient and/or family when developing a plan of care, and whether all team members actively look for ways to contribute to the care of the patient. It also includes questions about how the team members use the expertise of other team members, the effectiveness of communication among team members and the sharing of feedback about team performance. It has already been used to assess the functionality of interprofessional teams at an ambulatory HIV clinic, and its use will soon be expanded to other care settings.

**FIU HWCOM** is another consortium school working to improve assessment of interprofessional practice. During the second, third and fourth years at FIU HWCOM, medical students become part of interprofessional teams that include nursing, social work and/or physician assistant students as part of this medical school's "Green Family Foundation Neighborhood Health Education Learning Program" (NeighborhoodHELP™). In the first year, students participate in an interprofessional workshop experience with students representing seven disciplines in small group settings. Second- through fourth-year students in interprofessional teams go into households in underserved neighborhoods to take care of individual families/household members and learn cultural competence, interprofessional communication and collaboration, and gain an understanding of the social and behavioral determinants of health. Faculty from the medical school, as well as other health professions education schools, participate in the household visits, and law and education students are available by referral.

As part of the AMA consortium work, interprofessional tools have been developed to better assess these teams and track students—both as a cohort and individually—throughout the curriculum. The Community Engaged Neighborhood Health Education Learning Program Interprofessional Questionnaire (CENIQ) was adapted from the validated Readiness for Interprofessional Learning Scale (RIPLS) 1 and Entry-Level Interprofessional Questionnaire (ELIQ) 2 tools. The Visit Performance Assessment (VPA) rubric was adapted from the EPA 9 tool developed by the Association of American Medical Colleges' "Core Entrustable Professional Activities for Entering Residency" pilot. Results have demonstrated statistically significant improvement with interprofessional attitudes over two cohorts of students after they have been exposed to working in interprofessional teams.

## WORKING REMOTELY WITH OTHER HEALTH CARE PROFESSIONALS

**UND**'s project incorporates advanced simulation and telemedicine into education about providing care to those in rural or remote communities. In this project, it's not only the patient who may be connected by technology—other

1 *Health Professions Education: A Bridge to Quality*. Institute of Medicine. 2003. https://www.ncbi.nlm.nih.gov/books/NBK221519/. Accessed July 21, 2017.

2 *Core Competencies for Interprofessional Collaborative Practice*. Interprofessional Education Collaborative. 2011. https://www.aamc.org/download/186750/data/core_competencies.pdf. Accessed July 21, 2017.

members of the health care team may also be remote and accessible only by telemedicine technology.

UND's "Longitudinal Rural Interprofessional Healthcare Simulation" incorporates students from five health care professions into learning through simulation using different scenarios. The scenario series reflects the real-world longitudinal nature of health care delivery from diagnosis to intervention and treatment, and end-of-life. In each scenario, telemedicine is integrated as a natural part of the health care delivery process, with each profession playing a role consistent with how the case would typically unfold in the real world.

For example, in the first scenario "Sandra" arrives in the emergency department with chest pain/pressure in the center of her chest and radiating into her left axilla. She has been short of breath with activity for the past two days, and rest has not made it better. She is eventually diagnosed with a myocardial infarction and has a stent placed and an echocardiogram showing a 40 percent ejection fraction. She does not have cardiac rehabilitation in her small town and insists on going home. Interprofessional team members include a nurse, a physician and a cardiologist.

In the second scenario her primary care physician orders a home health assessment, and a care conference is called two weeks later. Home health identifies specific needs and involves other members of the health care team in planning. The team comprises a physician, a home health nurse, an occupational therapist, a physical therapist, a social worker and a family member. It is determined that Sandra should be admitted to long-term care.

In the final scenario, Sandra has been admitted to long-term care and has had a significant incident. She is physically deteriorating and in a critical state. During a telemedicine consult, end-of-life planning takes place. The team comprises a social worker, a physician and a nurse. Each of these scenarios requires a different mix of students and may be run back-to-back or over the course of weeks or months, depending on the needs of the curriculum and the available resources.

## CREATING TEAMS TO IMPROVE QUALITY, PATIENT SAFETY

**Emory**'s project standardizes education in quality improvement and patient safety across Emory's medical education continuum, including all Emory-affiliated medical students, residents, fellows, faculty, affiliated physicians and interprofessional colleagues. The goal is to ensure that all professional members of the Emory medical community have a shared understanding and approach to quality improvement and patient safety. Training designed for Emory faculty requires faculty members to enroll with at least one interprofessional team partner and at least one trainee. The faculty member, interprofessional partner and trainee attend training sessions and work on projects together.

## EMBEDDING STUDENTS IN INTERPROFESSIONAL TEAMS

Medical students at **CWRU** become part of interprofessional teams at one of two high-performing patient-centered medical homes (VA Center of Excellence in Primary Care Education or Neighborhood Family Practice, a federally qualified community health center). These care sites serve veterans and newly arrived refugee families. Each team manages and assesses the needs of a panel of 20 patients within each practice.

Also included in these teams are those studying advanced practice nursing, pharmacy, psychology and social work. The learning environment builds competencies in shared decision-making, interprofessional learning and quality improvement while students develop longitudinal relationships with patients and care teams within the clinic.

Students at **CUNY** are embedded at numerous federally qualified health centers in New York City. Students shadow physician preceptors during their first year of being embedded and develop their clinical history-taking skills. They also learn about team-based care and rotate with nurses, dieticians and social workers in order to understand how each professional contributes to patient care.

Students return to the same health centers during the following two years of their longitudinal clinical experience and assist with value-added tasks, such as medication reconciliation and developing and disseminating patient education tools. Students act as navigators accompanying patients through all points of their clinic visit and begin to identify the multiple points of care, the various members of a health team and their specific roles, ranging from the front desk, to nursing/triage staff, the physician, pharmacists, social workers and nutritionists.

In this community-based health care system, students not only develop their clinical skills but they also understand, appreciate and experience the roles of the other members of the health care team.

**Rutgers Robert Wood Johnson Medical School** is incorporating medical students and other health-profession learners into care-coordination teams within the Robert Wood Johnson Partners Accountable Care Organization (ACO). There are 35,000 patients in the ACO receiving care in one of the most racially/ethnically diverse states in the nation.

Interprofessional learner teams (ILTs) start by viewing a six-act play. This orients students to working in an ILT that consists of, in addition to medical students, those from the nursing, pharmacy, physician assistant and social work schools. ILTs augment care for patients with multiple chronic conditions and maximize integrated care delivery in the home setting. Medical students are coached by and collaborate with the existing care coordination teams and learn new models of health care delivery on a personal basis in patients' homes, along with the complexities of managing patients with multiple chronic conditions. Each ILT is required to develop

and submit an interdisciplinary clinical care and management plan based upon the findings of home-visit assessments.

### HEALTH PROFESSIONALS LEARNING TOGETHER

**UConn**'s new "MDelta" curriculum incorporates the Regenstrief EHR Clinical Learning Platform and a novel course called "VITALS" (Vertically Integrated Teams Aligned in Learning and Scholarship). MDelta, which began in 2016, is rolling out over four years. The VITALS course will ultimately bring teams of medical students together across all four years with dental students and other interprofessional partners to learn core skills such as law and ethics, evidence-based decision-making, social determinants of health and disparities and implementation science, all while they examine topics in current events that affect the health of communities (e.g., Zika, immunizations, gun violence). Assignments in VITALS will use the EHR to provide relevancy in terms of cases and methods of accessing information, allowing students to uncover the impact of social determinants of health on patients, their health and their health care. The VITALS course also has designed exercises in the Regenstrief EHR Clinical Learning Platform for students to explore population health issues.

# How soon is too soon, how late is too late to practice medicine?

**Medical schools are developing flexible competency-based pathways to identify students who may be able to move through medical education more quickly, as well as those who may need more time.**

Education at all levels is moving toward a greater focus on achieving competencies rather than time in seat.[1,2] Several schools in the AMA Accelerating Change in Medical Education Consortium are experimenting with flexible competency-based pathways that allow students to spend more or less time on skills and subject areas as needed. For example, a medical student who has already been educated and worked as a nurse, physician assistant or other health care professional may need less time with the portions of medical school that are duplicative of their earlier training. Others may need more time to address deficiencies, better absorb learning or develop skills to become good physicians.

**Oregon Health & Science University School of Medicine (OHSU)** and **Ohio University Heritage College of Osteopathic Medicine** are two of the consortium schools implementing flexible competency-based pathways.

### NOVEL AND RIGOROUS

**OHSU** joined the consortium in 2013 and has since implemented a novel, rigorous, learner-centered competency-based curriculum that allows students to pursue a broader array of interests, shifting the focus toward what students learn rather than what appears on a given exam. Students have opportunities to enter medical school at an advanced stage, progress at an accelerated pace and graduate in fewer than four years.

Students begin the curriculum with a pre-matriculation self-assessment and advance through individualized learning plans as they achieve key milestones across all six ACGME–ABMS competencies. These milestones are tracked by a web-based personal portfolio, and students receive badges for their achievements. Learners can monitor their progress in real time with comparisons to the aggregate of all OHSU medical students who entered the program in the same academic year. Students also can track trends in their progress.

Faculty members serve as student coaches and mentors, teaching and assessing skills related to informatics, quality science and interprofessional teamwork. They closely monitor students' academic progress, help students set personal learning goals and strategies, and determine their readiness for advancement through the curriculum based on demonstrated competencies. Students are assessed by frequent 360 evaluations, checklists, faculty observation, OSCEs, procedure and case logs, patient surveys, reviews of medical documentation, simulation experiences, standardized patient examinations, multiple-choice examinations, computer-based virtual cases, direct observation in clinical settings and reflective writing. Their customized curriculum is then adjusted accordingly.

OHSU also is fully incorporating newer methods of instruction such as flipped classrooms and asynchronous web-based modules. The badge system continues through to graduate medical education and continuing medical education.

### INTEGRATING PRIMARY CARE DELIVERY AND MEDICAL EDUCATION

**Ohio University Heritage College of Osteopathic Medicine** joined the consortium in 2016. It has developed a new osteopathic medical education curriculum, "Value-Based Care." This curriculum is an innovative, competency-based program

1 Mendenhall R. What Is Competency-Based Education? *Huffpost*. Sept. 5, 2012. http://www.huffingtonpost.com/dr-robert-mendenhall/competency-based-learning-_b_1855374.html. Accessed Aug. 1, 2017.

2 *Competency-Based Learning or Personalized Learning*. U.S. Department of Education. https://www.ed.gov/oii-news/competency-based-learning-or-personalized-learning. Accessed Aug. 1, 2017.

that integrates primary care delivery and medical education.

The competency-based system that is integral to this project continually assesses a student's readiness for practice. Students have to achieve didactic and clinical milestones that are not fixed in a specific timeframe. These milestones are incorporated into both medical school and residency.

The project also shifts the focus of medical education from acquisition of knowledge to application of knowledge with an emphasis on formative (ongoing) student evaluation. This is in contrast to the current system of summative (final) evaluation. Advancement is based solely on attainment of competencies determined by objective assessment, not by number of years in the program.

# Integrating curricular change across five states

**Taking transformation across state lines**

Historically, Northwestern states have not been populous enough to support a medical school and have, therefore, long relied on WWAMI, a regional medical education cooperative anchored by the **University of Washington School of Medicine (UWSOM)** for physician training.[1] This means that when UWSOM decided to change its curriculum, it had to do so at six locations in five states across three time zones.

**UWSOM** joined the AMA Accelerating Change in Medical Education Consortium in 2016. Since then, it has implemented a new curriculum structure across its sites in Washington, Wyoming, Montana, Alaska and Idaho, enhancing clinical training during the basic science years and basic science in the clinical years.

In order to implement change in a cohesive way across such great distances, UWSOM completed construction of new videoconferencing-enabled facilities in Seattle. Several regional sites also implemented significant audio-visual upgrades to their classrooms and equipment. This allows those teaching each of the content blocks to virtually plan, implement and evaluate the curriculum across time and space. As a result of the virtual planning and a heightened focus on multi-site collaboration, there is increasing collaboration between sites and significant efforts to assure that all materials, in class as well as out of class for each block, are the same.

As part of ongoing efforts to unify its geographically distant students and ensure preparation in core content areas, UWSOM created a novel, two-week board review curriculum exclusively using a distance-learning platform for its students preparing for the USMLE Step 1 exam. This set up allows students to be located anywhere while participating in review of high-yield topics. A total of 24 unique review sessions are offered. Sessions include brief pre-class material review (videos, readings) and then a live webinar, including board-style questions. Onscreen student panels from multiple sites provide an "audience" for speakers, and an audience response system along with an active question-and-answer forum facilitates student engagement and allows faculty to gauge student understanding and set the stage for presentation, discussion and questions. Some sessions use friendly competition to spur learning and student participation, such as game show formats with student group contestants and a prize trophy for the "winning team."

# Becoming a master adaptive learner

**Teaching physicians how to learn so they learn for a lifetime**

Physicians need to continuously adapt and learn in order to provide the best possible care; however, "adapting" and "learning" are skills in and of themselves that need to be acquired, learned and taught.[2] Several member schools of the AMA Accelerating Change in Medical Education Consortium such as **Vanderbilt University School of Medicine**, **University of Michigan Medical School**, **Oregon Health & Science University School of Medicine** and **New York University School of Medicine** have been developing the master adaptive learner model as part of a consortium interest group.

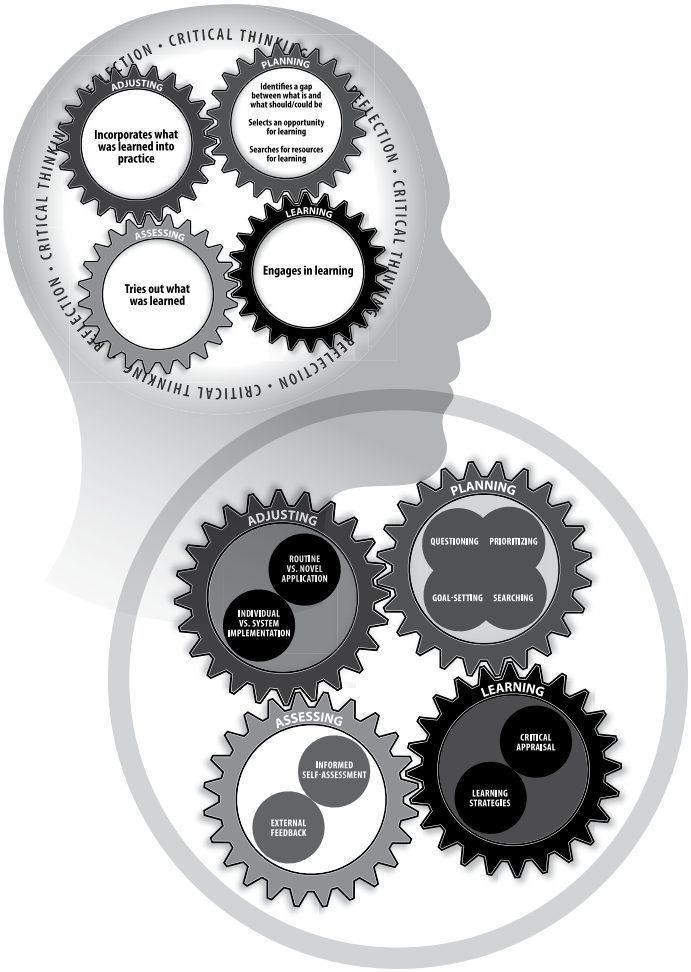
**Vanderbilt University School of Medicine** and **Harvard Medical School** are two of the consortium schools that have transformation projects focused on this area. Both schools are teaching future physicians the strategies they will need in order to be able to learn effectively in the health care environment, as well as manage constant change.

## CURRICULUM 2.0

**Vanderbilt**, which joined the consortium in 2013, has embarked on a broad restructuring of its curriculum. "Curriculum 2.0" uses flexible, competency-based pathways in order to create master adaptive learners—physicians who

1 UW Medicine. WWAMI. http://www.uwmedicine.org/education/wwami. Accessed Aug. 4, 2017.

2 Cutrer WB, Miller B, Pusic MV, Mejicano G, Mangrulkar RS, Gruppen LD, Hawkins RE, Skochelak SE, Moore DE Jr. Fostering the Development of Master Adaptive Learners: A Conceptual Model to Guide Skill Acquisition in Medical Education. *Academic Medicine*. 2017 Jan;92(1):70-75. https://www.ncbi.nlm.nih.gov/pubmed/27532867. Accessed July 27, 2017.




Cutrer WB, Miller B, Pusic MV, et al. Fostering the development of master adaptive learners: A conceptual model to guide skill acquisition in medical education. *Acad Med*. 2017; 92: 70-75. http://journals.lww.com/academicmedicine/Abstract/2017/01000/Fostering_the_Development_of_Master_Adaptive.24.aspx

learn, engage in guided self-assessment, and adapt to the evolving needs of their patients and the health care system throughout their careers. This marks a shift from the prior focus of medical education—which was to create fully loaded, pluripotent, naïve physicians—to creating physicians who are self-directed, critically thinking, expert workplace learners. These learners learn how to know what they don't know and appropriately use just-in-time knowledge resources and decision support systems to address identified gaps.

In order to achieve this goal, Vanderbilt has created a competency-based assessment system that guides student learning through flexible pathways with explicit, standardized expectations and provides accurate information for high-stakes decisions, independent of time, in the educational program.

Students design their two-year "Immersion" phase of the curriculum with the assistance of portfolio coaches. Categories of courses include integrated science courses, advanced clinical electives and acting internships. Scholarly projects are designed to ensure broad preparation. Students select experiences aligned with their personal learning goals and future career plans. Vanderbilt's competency-based assessment system has identified some students who needed additional development in a specific domain. These students were required to make competency-driven course selections. No two students have followed the same pathway to graduation, and each student has created a unique story while attaining standardized performance expectations.

A rich informatics and technology infrastructure collects learner experiences and assessments in the learning portfolio, aggregates and displays performance data in a way that facilitates interpretation and decision-making, and directs learners to knowledge and information resources.

For example, if communication skills are identified as an area for improvement, students are able to ask advice from designated faculty experts. At subsequent meetings with portfolio advisors, students review progress in attaining their objectives. Promotions committees have access to these personalized learning plans. If a committee has concerns about aspects of a student's performance, they review the plan to assure that it adequately addresses identified deficits.

This curriculum also includes core content and required activities designed to build the meta-cognitive skills needed for successful lifelong learning. This includes heuristics, bias, probability and confidence. Students practice critical thinking and information retrieval skills.

Additionally, Vanderbilt is working to develop a culture with an unwavering commitment to improvement. This means that the system rigorously evaluates its outcomes and welcomes the input of all stakeholders, including patients, faculty, staff and students. It's also safe for learners to be vulnerable and susceptible to the risks that underlie the quest for constant improvement.

Vanderbilt is continuously improving the logistics of its educational portfolio and is currently developing a GPS to further assist students in navigating the curriculum.

Students are expected to become progressively more skilled at self-assessment and to continue to accurately self-assess once in graduate medical education and in practice.

## FINDING A PATH

**Harvard Medical School**, which joined the consortium in 2016, has launched its "Pathways Curriculum" with the goal of creating master adaptive learners as well.

To achieve this goal, Harvard has reorganized its entire curriculum using new active-learning models and creating a mastery-oriented culture as opposed to a performance-oriented culture. This means faculty value their students' reasoning, not just whether the answer is correct. Students receive detailed feedback about their performance and are encouraged to reflect on how to improve. Students neither hesitate to admit uncertainty nor attempt to hide their shortcomings for fear of disapproval. The in-course assessment policy includes high-frequency, low-stakes testing and has been designed to discourage the negative cycle of fall-behind-and-cram. In each course, lectures have been reduced. The flipped classroom is being used, and problem-based learning

has been almost completely replaced by innovative small group learning.

Students are also encouraged to keep a learning log or academic diary with two sorts of running lists. The first contains topics, concepts and principles that they have not quite mastered. It constitutes a personalized compendium of material to go back to for further study, whether for an exam or during professional development. Over time, students are encouraged to review their logs and notes, growing mastery and development as they document new challenges for themselves and identify old material they no longer find challenging. The second list contains topics and concepts that students find interesting and wished they had more time to pursue. In the spirit of increasing curiosity and fostering individualized learning, students are given protected time at various points in the curriculum to follow through on topics that truly engage them.

A significant part of this project involves the development of a formalized method of analyzing medical school exam questions by using Bloom's taxonomy. Harvard is quantifying questions from each of the first-year medical school courses and providing course directors with feedback regarding the proportion of questions that are high-order thinking versus low-order thinking on their exams. Students also learn to classify exam questions based on Bloom's taxonomy as a metacognitive strategy that may help them improve their critical thinking skills and performance during examinations. The school will then provide students with individualized feedback on their performance answering various types of Bloom's taxonomy questions and will share with them specific strategies to use to be able to answer questions in the various categories. This is being tested to determine if this intervention could help to improve student performance in exams.

Harvard has also built a comprehensive system of formative student assessment that emphasizes reflection, gap analysis and individualized learning plans. This system involves assessment for learning as much as it does assessment of learning.

# Learning to care for a population of patients

**The modern health care system needs physicians who think beyond caring for each patient on an ad hoc basis.**

A core subject area within health systems science,[1] population health, defined as "the health outcomes of a group of individuals, including the distribution of health outcomes within the group,"[2] is an important discipline that is gaining significant traction. While its growth has been partly in reaction to policy and regulatory changes for public and private payers, population health—and a better understanding of how it affects patient care—can both improve patient safety and health care quality.

**The Warren Alpert Medical School of Brown University**, **Mayo Clinic School of Medicine**, **New York University School of Medicine (NYU)**, **Case Western Reserve University School of Medicine (CWRU)** and the **University of Connecticut School of Medicine (UConn)** are some of the member schools of the AMA Accelerating Change in Medical Education Consortium that have incorporated the teaching of population health into their transformation projects.

## REDUCING REDUNDANCIES

**Brown** joined the consortium in 2013 and has since developed nine new courses that comprise a Master of Science degree in population medicine. Courses are integrated with basic and clinical science instruction and cover health systems, health policy, the role of law and policy in health disparities and social determinants of health, health safety nets, research methods in population medicine, leadership, quality Improvement, patient safety, the social and community context of health care, biostatistics and epidemiology. Portions of these courses are required for all medical students even if they do not intend to complete the master's degree.

The pre-clerkship curriculum relies on active learning methods, including problem-based learning (PBL), case-based learning (CBL) and team-based learning (TBL) to the exclusion of lectures. Brown did not, however, just add population health to an already crowded basic science curriculum. Brown analyzed the curriculum to identify and reduce redundancies and education that was not providing high value.

In order to further students' understanding of population health and other health systems science topics, Brown also has developed a longitudinal integrated clerkship. Students acquire a continuity patient early in the clerkship and act as clinical service providers while concurrently completing coursework in clinical medicine along with didactic classes and preparation of a thesis in population medicine. Students also have the opportunity to compare and contrast health care system successes. All clerkship students participate together in weekly experiences; although, they are divided across three separate clinical systems (two private nonprofits and one Veterans Affairs), each with unique population medicine challenges and successes.

## DUAL DEGREE

**Mayo Clinic** joined the consortium in 2013. Population health is a significant aspect of its health systems science-blended learning curriculum, and medical students also have the

1 Skochelak SE, Hawkins RE, Lawson LE, Starr SR, Borkan JM, Gonzalo JD. *Health Systems Science*. Philadelphia, PA., Elsevier. 2017.

2 Kindig D, Stoddart G. What is population health? *American Journal of Public Health*. 2003; 93 (3):380-383.

option to complete an additional 12 credits in order to complete a master's degree in the science of health care delivery from Arizona State University. Mayo uses online modules that include topics such as health care disparities, population and preventive health, and new models of care delivery to meet the Triple Aim. The experiential curriculum includes early exposure to team-based care within a medical home, a cultural humility workshop, a cross-cultural communication simulation with standardized patients and a data analytics exercise. Students team with seasoned faculty members who teach principles of community engagement. Additionally, Mayo has created a set of health systems science-related milestones applicable to population health (and the other five domains within their curriculum) that align with Accreditation Council for Graduate Medical Education (ACGME) competencies. Medical students also have the opportunity to participate in opportunities to improve the health of the local population, such as assisting with a school-located immunization program and helping people sign up for health insurance.

## APPROACHES TO POPULATION MANAGEMENT

**NYU** joined the consortium in 2013. Its medical students are guided through an integrated longitudinal care coordination and analysis curriculum. The overarching goals are to stimulate systems thinking, promote population management approaches to improving patient safety, increase effectiveness of care and efficiency, demonstrate critical thinking approaches, and bridge the disconnect between local quality improvement practices and the curriculum. Educational activities demonstrate how careful attention to population-level patterns can inform both individual patient care and practice-based learning.

A significant part of this program is "Health Care By the Numbers," a flexible, technology-enabled curriculum to train medical students in using big data (extremely large and complex data sets) to improve care coordination, health care quality and the health of populations. Over seven million de-identified patient level records are available for student projects. Students can explore every inpatient admission by DRG code, providers, charges or hospitals. The data set is continually expanded and refined.

Medical students develop their skills in examining data across panels of patients, recognize the strengths and pitfalls of analyzing big clinical databases, and demonstrate an ability to work with large data sets to answer clinical questions and improve care quality. Medical students work in pairs to identify clinical hypotheses generated by the data set and wrestle with the questions associated with using big data, such as: Can a large retrospective N obviate the need for prospective sampling? When does the "messiness" of big data matter? When a correlation in a big data set is identified, how should it be investigated? The technology infrastructure for the NYU Health Care by the Numbers curriculum is open to the public at: http://ace.iime.cloud.

## HIGH-PERFORMING SYSTEMS

**CWRU** joined the consortium in 2016 and has since implemented a patient-navigator model to work with specific populations at one of two high-performing patient-centered medical homes (VA Center of Excellence in Primary Care Education and Neighborhood Family Practice, a federally qualified community health center). Navigators become part of interprofessional teams caring for a panel of 20 patients and perform a variety of functions. They also work with the electronic health record systems at their sites and receive targeted trainings around EHR navigation and the creation and use of registries for population health management in specific populations (veterans and newly arrived refugees). They learn to identify the health care systems gaps in care while addressing individual care needs for their cohort of patients.

## VIRTUAL POPULATIONS

**UConn** joined the consortium in 2016 and has since incorporated the Regenstrief EHR Clinical Learning Platform into the first year of its new "MDelta" curriculum, which is being rolled out over four years. UConn, working with Indiana University School of Medicine (IUSM)/Regenstrief, has modified existing cases within the platform's registry of real de-identified and misidentified patients to meet its needs. These cases have been assembled into three extended families of virtual patients who are used throughout Stage 1 of the curriculum (first 18 months). By anonymously rendering such a large number of diverse cases, students are able to explore, review and research population health and health policy issues as part of interprofessional learning teams. This provides opportunities for students to use population-based search tools in order to answer population health questions. For example, students have created frequency tables demonstrating that increasing levels of LDL correlated with increasing numbers of patients with myocardial infarction (MI). In doing so, students also have documented the challenges of using the EHR to define and analyze problems. The curriculum also has been designed so that every medical student can receive a public health certificate with a focus on social determinants of health and disparities in addition to their medical degree.

# Teaching the social determinants of health

**Medical schools are increasingly incorporating instruction about all the components that determine a person's health status into the curriculum.**

Most disease is a result of the conditions in which people live and work, as well as genetic and demographic predisposition.[1] Understanding the social determinants of health is critical to addressing population health and health inequalities and is a core subject of health systems science.[2]

The **University of California, Davis, School of Medicine (UC Davis)**, **A.T. Still University-School of Osteopathic Medicine in Arizona (ATSU-SOMA)** and **Florida International University Herbert Wertheim College of Medicine (FIU HWCOM)** are three of the member schools of the AMA Accelerating Change in Medical Education Consortium that have integrated the teaching of social determinants of health throughout their curriculum.

## A THREE-YEAR TRACK

**UC Davis** joined the consortium in 2013. It established a model three-year education track, the Davis Accelerated Competency-based Education in Primary Care (ACE-PC) program, and implemented it in close collaboration with Kaiser Permanente of Northern California, the largest health care provider in the region. This program endeavors to improve diversity in the physician workforce and increase the number of primary care physicians. Addressing social determinants of health is central to the program's mission and curriculum. Over 50 percent of enrolled students come from communities traditionally underrepresented in medicine, and almost all have expressed a commitment to working with underserved populations.

UC Davis ACE-PC students are embedded into Kaiser Permanente's integrated health care delivery system and patient-centered medical home model. Each student works with a dedicated Kaiser clinician who acts as a mentor-coach and translates classroom learning into everyday clinical practice skills. The students learn population management, chronic disease management, quality improvement, patient safety, team-based care and preventive health skills within Kaiser Permanente's state-of-the-art ambulatory facilities.

## LEARNING IN CONTEXT

**ATSU-SOMA** joined the consortium in 2016. It has a partnership with the National Association of Community Health Centers that allows its second-, third- and fourth-year medical students to be embedded at 12 rural and urban community health centers for contextual learning about the social determinants of health, along with the other aspects of health systems science and the basic and clinical sciences.

Patient panels include a wide array of vulnerable populations, including rural Appalachian farmers, ethnic groups in the low-country of South Carolina, isolated American Indians, Hawaiian natives, urban homeless, émigrés, those with HIV and others. Students live in the community and work with providers dedicated to serving underserved patients and whole communities, developing a fuller perspective of the challenges patients experience when trying to access health care services.

All of ATSU-SOMA's medical students are required to enroll in courses that teach the fundamentals required for community-based participatory research, including how to conduct needs assessments and design/implement community projects addressing the social and economic determinants of health.

As part of a year-long course in epidemiology, biostatistics and preventive medicine, second-year students are provided detailed instructions, tools, templates, evaluation rubrics and continuous support in order to conduct needs assessments and work with community health center leadership and community stakeholders as they create and implement community-based research, quality improvement or service projects that recognize the local, social and economic determinants of health. Within the framework of community-oriented primary care, students are encouraged to work on projects addressing issues that local leaders and community members consider important. Student teams compete for the privilege of presenting their community project results at a national conference of community health center providers and leaders.

## REACHING OUT

**FIU HWCOM** joined the consortium in 2016. It's building on its "Green Family Foundation Neighborhood Health Education Learning" program (NeighborhoodHELP™). This program focuses on the social and behavioral determinants of health. In the first year of medical school, students are introduced to the school's community outreach team, which has relationships with more than 160 community partners. During the second, third and fourth years, students become part of a team of interprofessional students that goes into households to take care of individual, underserved families. Students learn cultural competence, interprofessional communication and collaboration, an understanding of the social and behavioral determinants of health, and ethical principles and non-health policy as related to overall health. Faculty from the medical school, as well as other health professions education schools, including nursing and social work, participate in the household visits and supervise students in their respective disciplines. Law and education faculty and students are available by referral.

1 Stonington S, Holmes SM. Social medicine in the twenty-first century. *PLoS Med*. 2006;3(10):e445.

2 Skochelak SE, Hawkins RE, Lawson LE, Starr SR, Borkan JM, Gonzalo JD. *Health Systems Science*. Philadelphia, PA., Elsevier. 2017.

FIU HWCOM is in the process of developing an information technology infrastructure to capture the novel workflows related to social and behavioral determinants of health and will then integrate this data in a useable format into its electronic health record with the goal of continuing to improve population health and create socially accountable future physicians.

# Building a pipeline for physician diversity

**Reaching out and providing support to students from underrepresented groups**

Medicine has long struggled with attracting and keeping those who have been underrepresented among the ranks of physicians. In recent years, physicians have become increasingly female, but the racial and ethnic composition of the physician workforce has not changed significantly. Minority-serving institutions continue to be the largest producers of physicians historically underrepresented in medicine.[1]

**Morehouse School of Medicine**, a historically black free-standing school of medicine, joined the AMA Accelerating Change in Medical Education Consortium in 2016. Approximately 75 percent of its students are from groups underrepresented in medicine. The attrition rate is below 2 percent, and the pass rates on USMLE Step 1 exceed national rates.

This medical school's efforts to increase diversity begin before students matriculate medical school. Morehouse has developed enhanced pipeline efforts with local colleges, expanded pipeline mentoring support across the state of Georgia through alumni, established an undergraduate health sciences academy with other historically black institutions in the region, and engaged current students in longitudinal peer mentoring of pipeline students.

In order to educate greater numbers of physicians and expand its social mission, Morehouse also has increased its class size and its community-based sites. In order to maintain its low attrition rate, Morehouse has created a curriculum that allows for strong faculty-student interactions with longitudinal supervision by a limited number of faculty. The preclinical curriculum is structured to incrementally build concepts and skills. Students are monitored with regular examinations and feedback with early support for deficits.

In addition, Morehouse has established learning communities designed to assure the development of strong longitudinal faculty-student and student-student interactions to facilitate the professional transition process. These communities emphasize early skill building and career awareness, and students are placed in them beginning from day one of medical school. Learning communities are linked to a community health course that allows students to engage with local underserved populations for all four years of medical school.

# Transforming the transition from medical school to residency

**For many medical students, the leap from undergraduate medical education to graduate medical education can be difficult—but it doesn't have to be.**

Every year on July 1, groups of newly minted MDs and DOs begin graduate medical education (GME)—their next step to becoming independent, fully trained physicians.[2] The shift from undergraduate medical education (UME), which tends to be a supportive environment with significant amounts of supervision, to a demanding hospital or outpatient setting with less support and increasing responsibility for patient care, can be challenging and sometimes traumatic.[3]

**The University of California, Davis, School of Medicine (UC Davis)**, **Ohio University Heritage College of Osteopathic Medicine** and the **University of Michigan Medical School (UofM)** are some of the member schools of the AMA Accelerating Change in Medical Education Consortium working to improve the transition to residency and improve the educational hand off. **UC Davis** and **UofM** joined the consortium in 2013. **Ohio University Heritage College of Osteopathic Medicine** joined the consortium in 2016.

1 *Current Status of the U.S. Physician Workforce.* Association of American Medical Colleges. http://aamcdiversityfactsandfigures.org/section-ii-current-status-of-us-physician-workforce/. Accessed Aug. 1, 2017.

2 Kirch DG. Improving the Transition to Residency. *AAMC News*. June 26, 2017. https://news.aamc.org/medical-education/article/improving-transition-residency/. Accessed Aug. 2, 2017.

3 Rich P. *Transition to residency is tough everywhere.* Canadian Medical Association. Sept. 18, 2014. https://www.cma.ca/En/Pages/transition-to-residency-is-tough-everywhere.aspx. Accessed Aug. 2, 2017.

## A SEAMLESS TRANSITION

**UC Davis** has established the Davis Accelerated Competency-based Education in Primary Care (ACE-PC) program, a six-year, competency-based UME/GME pathway. Medical students accepted into the ACE-PC program are embedded into the integrated health care delivery system and patient-centered medical home model of Kaiser Permanente of Northern California, the largest health care provider in the state. Each student works with a dedicated Kaiser clinician who acts as a mentor-coach and translates classroom learning into everyday clinical practice skills. ACE-PC students receive a conditional acceptance to one of four partner primary care residency programs affiliated with UC Davis and Kaiser Permanente.

In order to enhance collaboration across the UME/GME continuum, residency program directors are involved in all aspects of the UME program, including program design and implementation, admissions, retention, fundraising, and faculty selection and development. Frequent interaction between ACE-PC students and GME faculty and residents helps students develop a sense of belonging in the GME space. General conditions of acceptance into GME include academic and clinical performance expectations developed by the key UME and GME stakeholders. GME program faculty also contribute to advancement, leave of absence and deceleration decisions. The GME programs comply with National Residency Matching Program guidelines.

The ACE-PC program focuses on students seeking to specialize in adult primary care, including general internal medicine or family medicine. Other specialties, such as general psychiatry and possibly general surgery, will be added in future years in response to other critical workforce shortages.

**Ohio University Heritage College of Osteopathic Medicine** implemented a continuous longitudinal UME/GME program similar to the one at UC Davis. Students are embedded within a patient-centered medical home operated by the Cleveland Clinic in order to promote a seamless continuum between UME, GME and clinical practice.

A key element of this program is a competency-based system that assesses a student's readiness for practice. This system is contingent upon the satisfactory achievement of didactic and clinical milestones that are not fixed in a specific timeframe. The project team has developed and validated the competencies and incorporated them into the six years of UME and GME.

## STRENGTHENING UME/GME LINKS

**UofM** has been transforming its entire curriculum in order to graduate physician leaders who will improve health care at a patient and system level, as well as be ready to thrive in residency on day one. The final phase of this transformed curriculum is the 18-month customized professional development branches, designed to develop advanced skill sets within clinical and professional domains. Each branch addresses longitudinal advanced doctoring experiences and milestone-facilitated transitions between medical school and GME programs.

Toward the end of each branch experience, medical students participate in a required residency preparatory course, which leads to the creation of an individualized milestone progress report. This is delivered to the students' receiving residency program director as part of a responsible educational handover.

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# Creating a community of innovation

## Annotated bibliography

**This annotated bibliography is a compilation of scholarly work published by the schools of the American Medical Association Accelerating Change in Medical Education Consortium related to the innovations being implemented through consortium grants.**

Suggestions for additions, deletions, or edits should be emailed to **changemeded@ama-assn.org**.

Links directly to the journal article or the National Library of Medicine listing are provided when available. Some journals are open access. Others require a subscription.

**Ayala N, MacDonnell CP, Dumenco L, Dollase R, George P. A cross-sectional analysis of perceptions of interprofessional education in medical students. *Ann Behav Sci Med Educ*. 2014;20:6-9.**

This article describes a longitudinal study examining medical students' attitudes toward other health professions and interprofessional collaboration throughout their four years of medical school training. Medical students in this study participated in two required interprofessional education activities prior to graduation. One workshop occurred early in their second year. The second occurred in the beginning of their third year. The study also included first year medical students as a control group since they had not yet participated in an interprofessional workshop. The Readiness for Interprofessional Learning Scale (RIPLS) was used to measure students' perceptions toward interprofessional education. There was a statistically significant difference on the total RIPLS score between the Year 1 mean and the Year 4 mean. However, the difference disappeared when the Year 2 mean was compared with the Year 4 mean. This article informs efforts made by schools working to better integrate interprofessional education into their curricula by demonstrating that both formal and informal opportunities improve student attitudes toward interprofessional collaboration.

**Banerjee R, George P, Priebe C, Alper E. Medical student awareness of and interest in clinical informatics. *J AM Med Inform Assoc*. 2015;22:e42-e47.**

This article describes a study about medical students' attitudes toward clinical informatics (CI) training and careers. A web-based survey was distributed to the students at four allopathic medical schools. The survey provided definitions and examples of CI electives for medical students, CI electives during residency, and CI academic fellowships. The survey then asked students to rate their previous awareness and their potential interest in each of these opportunities. Five hundred and fifty-seven medical students responded. Thirty percent of the student respondents expressed at least some interest in a CI-related career, but they were no more aware of training opportunities than their peers who did not express such an interest. This article informs the work of medical educators interested in improving CI training by identifying a need for CI training and mentoring opportunities that may positively influence the size and skill set of the future CI workforce.

**Baxley EG, Lawson L, Garrison HG, et al. The teachers of quality academy: A learning community approach to preparing faculty to teach health systems science. *Acad Med*. 2016;91:1655-1660.**

This article describes the Teachers of Quality Academy (TQA) program established by Brody School of Medicine at East Carolina University in January 2014. The program had a dual goal of preparing faculty to lead frontline clinical transformation while becoming proficient in pedagogy and curriculum design necessary to prepare students for developing health systems science (HSS) competencies. The TQA included the completion of the Institute for Healthcare Improvement Open School Basic Certificate in Quality and Safety; participation in six two-day learning sessions on key HSS topics; completion of a quality improvement (QI) project; and participation in three online graduate courses. Twenty-seven faculty members from four health science programs completed the program. All completed their QI projects. Nineteen (70%) have been formally engaged in the design and delivery of the medical student curriculum in HSS. This article informs faculty development programs in health professions education by outlining a faculty development curriculum for improving knowledge and skills in HSS as an educational initiative for faculty.

**Brown DR, Warren JB, Hyderi A, et al. Finding a path to entrustment in undergraduate medical education: A progress report from the AAMC Core Entrustable Professional Activities for Entering Residency Entrustment Concept Group. *Acad Med*. 2017;92:774-779.**

This paper describes the progress of schools piloting the 13 core entrustable professional activities (EPA) for Entering Residency, which were created to address gaps between medical school and residency, and better prepare medical students to meet the expectations of their residency program directors. The core EPAs provide a framework for supervisors to be able to utilize assessments and provide feedback to students about their ability to perform in workplace settings. Ten medical schools are piloting the implementation and evaluation of the core EPAs to better understand how to entrust students to perform specified activities. Within the pilot, one work group focused on the concept of entrustment and developed guiding principles for entrustment based on discussions and a literature review. This group discussed the entrustment process in the context of perceived trust of the learner, a supervisor's overall workplace-based assessment of a learner, and the summative decisions made for each core EPA. Entrustment was defined at the point that students have the required knowledge, skills, and attitudes, as well as at the point of demonstrating elements of trustworthiness which indicate student entrustment of performing a core EPA without supervision. In addition, the workgroup recommends guiding principles for making summative decisions to make this process more transparent for students and faculty. This workgroup created a developmental framework of trustworthiness, which is comprised of three distinct dimensions: discernment of limitations, truthfulness, and conscientiousness. Various elements of this framework will be tested in the next phase of the pilot including the validity of the scale and various approaches used by each school. Furthermore, the group will continue to evaluate and discuss facilitators and barriers to implementing the guiding principles within each school. The future work of this group in evaluating the entrustment process and piloting different approaches to compiling evidence of trustworthiness will help inform medical schools' efforts in implementing a deliberate approach to assessment that bridges the gap between medical school and residency.

**Bumsted T, Schneider BN, Deiorio NM. Considerations for medical students and advisors after an unsuccessful match. *Acad Med*. 2017;92:918-922.**

This perspective article discusses issues related to unmatched medical students, as well as options that they may consider with their advisors and medical schools through this difficult experience. First, students and faculty need to familiarize themselves with their school's policy for delaying graduation. Many schools do not include matching as a requirement for graduating. While delaying graduation may assist students in improving clinical skills and procuring stronger letters of recommendation, this may not be allowed at some institutions. Some schools do not allow this option once students have met graduation requirements to avoid jeopardizing a student's ability to graduate if they are already in good standing, increased indebtedness, and clinical site capacity. Second, it is unclear if adding more information to the Dean's Letter will increase the likelihood that a student will match in subsequent cycles. However, the authors recommend an addendum describing experiences not covered in the previous Dean's Letter. Additional information about experiences in advanced clinical rotations may be an important factor for program directors seeking more clinical performance evaluations. If an unmatched student is unable to obtain a residency position during the SOAP process, they generally have three options: seeking a position immediately following the SOAP but before residency begins; obtaining a position the year following residency due to a vacancy; reapplying the next year, whether to the same specialty or a different one. The authors also identified the 10 out of 33 factors program directors consider in applicants can be improved on after the initial match process. Alternative avenues for unmatched students to strengthen their application include paid employment, volunteer work, or obtaining an additional degree or certification, while others may decide to pursue a nonclinical career. Lastly, the authors offer guidelines to faculty members on advising unmatched students. This perspective assists medical schools in creating deliberate strategies for advising unmatched students, particularly at a time in which medical schools are actively working toward decreasing the shortage of primary care physicians.

**Burk-Rafel J, Mullan PB, Wagenschutz H, Pulst-Korenberg A, Skye E, Davis MM. Scholarly concentration program development: A generalizable, data-driven approach. *Acad Med*. 2016;91:S16-S23.**

This article describes an approach that medical schools can use to develop scholarly concentration programs based on student preferences and existing expertise. First the authors thematically analyzed the internet content of scholarly concentration programs at top research or primary care United States medical schools. Next, the authors conducted a survey to understand which scholarly concentrations were of interest to students at their institution. Exploratory factor analysis was used to examine the relationships between topics which were rated by students on the survey, and an optimization algorithm was created to understand logistical approaches to increasing the number of students able to participate in their first or second choice of concentration. The factor analysis indicated eight pathway preferences that medical schools could implement. The algorithm determined that offering six pathways would allow 95% of a 171 student first-year class to participate in their first or second choice. This article informs medical schools exploring implementation of scholarly concentrations to provide more learner-focused opportunities.

**Cangiarella J, Fancher T, Jones B, et al. Three-year MD programs: Perspectives from the Consortium of Accelerated Medical Pathway Programs (CAMPP). *Acad Med*. 2017;92:483-490.**

This article describes the three-year medical degree programs of medical schools that are members of the Consortium of Accelerated Medical Pathway Programs (CAMPP), which is supported by the Josiah Macy Jr. Foundation. The goal of the consortium is to provide networking support and collaboration opportunities for medical schools with existing accelerated programs, as well as provide information regarding scalable, replicable, and portable models for medical schools considering implementing an accelerated program. This article describes each program's specialty focus, mission, financial support, and student selection process among other relevant descriptive information. In addition, the authors address concerns with regard to students in accelerated programs learning the same content as their peers in traditional programs, as well as regulatory requirements and the implications of different options regarding the residency match. Lastly, the authors describe lessons they have learned through implementing an accelerated program. The work of the CAMPP helps medical schools understand how to improve the continuum from undergraduate medical education to graduate medical education, particularly as it relates to implementing competency-based education programs which may accelerate a student's progress toward graduation.

**Carney PA, Haedinger LA, Kahl LE, Deiorio NM, Bonura EM, Kraakevik JA. The association between assigned independent learning schedule and medical student performance on examinations. *Med Sci Educ*. 2017;27:253-257.**

This article explores the experiences of one medical school with a schedule structure that provides students with independent learning time throughout the week with weekly examinations occurring on Friday. Independent learning times are available on Monday afternoons, Tuesday mornings, and Thursday afternoons. Students assigned to Monday and Tuesday times were concerned that they were at a disadvantage because they had less study time just prior to the examination. In response, the school conducted a study with one class of medical students (second class to participate in the new curriculum and structure). There was no statistical difference in weekly test scores based on when students were assigned to an independent learning time. As medical schools begin to reform their curriculum and structure, it is important to develop an evidence base for new concerns that may arise. This awareness will lead learners and researchers to explore other ways to improve examination performance and will inform the work of other medical schools implementing curricular reform.

**Chen HC, McNamara M, Teherani A, ten Cate O, O'Sullivan P. Developing entrustable professional activities for entry into clerkship. *Acad Med*. 2016;91:247-255.**

This article describes a multistep process for developing and appraising content validity evidence for entrustable professional activities (EPA) for clerkship entry. The process started with a study of student-run clinics, the results of which were confirmed with preceptor interviews and student focus groups. To ensure the relevance and adequacy of the EPA content domains derived from this process, they were mapped to existing competency frameworks to establish credibility with stakeholders and provide a framework for observation and assessment. Next, with the assistance of experts, the content of each EPA was expanded on beyond its content domain to include a detailed delineation of the expected observable behaviors and the context for those behaviors. These EPAs were further refined three times with the help of local, national, and international medical educators through meetings and conferences. A final review was conducted with an EPA expert and local stakeholders to ensure adherence to EPA principles and the appropriateness and alignment of the EPA content with curricular objectives. The EPAs developed, as

well as the multistep process utilized to develop them, informs both local and national efforts in developing or improving competency frameworks for new content areas.

**Chertoff J, Wright A, Novak M, et al. Status of portfolios in undergraduate medical education in the LCME accredited US medical school. *Med Teach*. 2016;38:886-896.**

This article describes the results of a survey to investigate the number of medical schools accredited by the Liaison Committee on Medical Education utilizing portfolios, the format of portfolios, information technology (IT) innovations, purpose of portfolios, and their ability to engage faculty and students. The majority of schools that responded and identified themselves as portfolio-users, utilized electronic longitudinal competency-based portfolios with a minority utilizing visual tracking of student progress over time. Less than half of respondents reported that portfolios were used for formative and/or summative purposes. Respondents also described faculty development as the most important barrier to implementing portfolios, which may lead to poor faculty engagement. Likewise, respondents identified dedicated mentorship for the students as the most important facilitator of portfolio success. Another barrier to implementing portfolios is student resistance due to limited experience and lack of engagement in reflective learning. Lastly, IT and administrative support was identified as a facilitator to implementing portfolios, particularly with IT support that is responsive to user input. This study informs efforts made by medical education programs by identifying education technology needs for medical schools, as well as by describing factors that can facilitate and hinder IT implementation within a specific locale.

**Clay AS, Chudgar SM, Turner KM, et al. How prepared are medical and nursing students to identify common hazards in the intensive care unit? *Ann Am Thorac Soc*. 2017;14:543-549.**

This study explores how often nursing and medical students identify patient safety issues in hospital settings, as well as the differences in individual and team performance. Ninety-three fourth-year medical students and 51 accelerated Bachelor of Science in Nursing students participated in the "Room of Horrors" simulation as a mandatory component of their coursework. These sessions occurred in a high-fidelity simulation room. Each student completed an individual simulation and an interprofessional team simulation. These sessions occurred in a hospital setting and included hazards specific to infection control, hospital-acquired infections, skin breakdown, and delirium. Assessment data from the individual simulations informed a patient safety discussion that occurred one week later, which was followed by the team-based simulation. A mixed-methods approach was used to identify how often students identified patient safety issues and to understand differences in individual and team performance. Overall, hazard identification was low, and there were interprofessional differences. While medical students were more likely to identify indications for several therapies, nursing students were more likely to identify improper use or incorrect functioning of medical equipment. Although interprofessional teams of students performed better than individuals, teams missed many patient safety hazards that are specific to the intensive care unit. A majority of students who completed an evaluation for the activity indicated that the "Room of Horrors" should be used again and provided examples for why they were able to identify more hazards as an interprofessional team. This study informs health professions education programs implementing patient safety and interprofessional practice assessments. This simulation can be administered to students, faculty, and practitioners and can inform health systems of gaps in their patient safety practices.

**Clyne B, Rapoza B, George P. Leadership in undergraduate medical education: Training future physician leaders. *R I Med J*. 2015;98:36-40.**

This article describes the design and implementation of a leadership curriculum at the Warren Alpert Medical School of Brown University (AMS) for students in the primary care-population medicine program with the goal of engaging students with leadership topics starting early in the preclinical stages of training. The "Leadership in Health Care" (LHC) course was designed based on multiple needs assessments, interviews with physician leaders, and consideration of a wide range of leadership theories relevant to health care and appropriate to student curriculum. Each LHC session focuses on one core topic using techniques that address the needs of adult learners. They are designed to be goal-oriented, related to prior experiences, practical, and interactive. Lastly, a critical component of the LHC course is the leadership action project, which is a longitudinal, experiential learning, team activity that allows students to apply lessons learned in class to their leadership development. This article informs medical schools seeking to offer evidence-based leadership experiences at their institutions.

**Cook D, Triola M. *Educational technologies in health professions education: Current state and future directions*. Josiah Macy Jr Foundation Conference on Enhancing Health Professions Education through Technology. 2015:71-111.**

This paper, commissioned by the Josiah Macy Jr. Foundation, explores the various technologies currently available for health professions education (HPE), the extent to which technologies have delivered on promised transformations, and how faculty in HPE may maximize the value of educational technologies. Educational technologies (ET) are defined as materials and devices created or adapted to solve practical problems related to training, learner assessment, or education administration. Specific educational technology trends in HPE are discussed. While computer-based technology can facilitate the transmission of information and the collection and analysis of data, technology itself will not transform how students learn and educators must continue to focus on the fundamental principles of learning. In addition, due to the variation of institutional needs, it may be impossible to mandate any specific technological infrastructure other than access to human expertise in developing and implementing needed solutions. As such, administrators need to develop both depth and diversity in local teaching expertise, and the community at large needs to develop a culture of sharing. Lastly, the authors call for increased scholarly efforts directed to developing an evidence base of ET that ask questions pertaining to the design and effective implementation of future courses, rather than comparisons of the past. This paper informs the broader health professions education community on the necessary next steps for better implementing and integrating ET within educational experiences.

**Cunningham PRG, Baxley EG, Garrison HG. Transforming medical education is key to meeting North Carolina's physician workforce needs. *NCMJ*. 2016;77:115-120.**

This article discusses the role of Brody School of Medicine's model of preparing a primary care physician workforce for meeting North Carolina's (NC) future physician workforce needs. Brody's success in meeting its mission of increasing the supply of primary care physicians in NC can be attributed to recruiting students only from NC, conducting a holistic review of applicants, providing a primary care-focused educational process, and maintaining low tuition rates so specialty choice is not significantly influenced by student debt. To address continuing issues of disparities within NC, Brody is focusing on improving the competency of its graduates in health systems science and preparing its faculty to institute a curricular emphasis

on health systems science. In addition, Brody is reemphasizing its original mission to continue addressing the racial and ethnic diversity of NC's current health care professionals by ensuring that as much as one-fifth of each medical school class is comprised of minority students (compared to a national mean of 6%). Moving forward, the ongoing decline in the number of primary care physicians who choose to practice in NC needs to be addressed, and NC must find ways to increase residency positions in the state and create more opportunities for medical school graduates to do at least part of their residency training in rural areas of NC. Lastly, NC must create policies, mechanisms, and incentives that will help them meet the health care needs of the future. This article validates the continued need for innovation in both undergraduate and graduate medical education to address the needs of disparate populations in the United States.

**Cutrer WB, Miller B, Pusic MV, et al. Fostering the development of master adaptive learners: A conceptual model to guide skill acquisition in medical education. *Acad Med*. 2017;92:70-75.**

This article introduces and discusses the conceptual model of a master adaptive learner (MAL), which will provide future physicians with strategies for learning within and adapting to a changing health care environment more effectively. The concept of a MAL describes a metacognitive approach for learning based on self-regulation that can foster the development and use of adaptive expertise in practice. Specific behaviors related to preparation for future learning, such as asking pertinent questions, using resources that lead to practice change, and strategically seeking feedback are the foundation of a MAL who functions effectively, balancing routine and adaptive expertise. In addition, the MAL model was informed by the Practice-Based Learning and Improvement competency domain of the Accreditation Council for Graduate Medical Education and the American Board of Medical Specialties, as well as the plan-do-study-act cycle used for continuous quality improvement. The major components of the MAL process are planning, learning, assessing, and adjusting. The process for moving among these phases is meant to be iterative, based on existing issues that are resolved and new questions that emerge. The MAL model and this article informs the health professions education community's understanding of components related to student development, outcomes, and the impact of the learning environment.

**Daniel M, Fleming A, Grochowski CO, et al. Why not wait? Eight institutions share their experiences moving United States Medical Licensing Examination Step 1 after core clinical clerkships. [published online ahead of print April 18, 2017]. *Acad Med*. doi:10.1097/ACM.0000000000001714**

This perspective article explores the experiences of eight medical schools that made curricular changes facilitating students' completion of the United States Medical Licensing Examination (USMLE) Step 1 examination after they complete the core clerkships. Currently, there is no consensus on this topic, and studies examining basic science retention after completion of the USMLE Step 1 have some inconsistencies. Medical schools that have made this change have done so with the goals of improving retention of basic science content, integration of basic science content within clinical settings, and student preparation for the USMLE Step 1 as the vignettes used within the examination have become longer, more complicated, and more clinically focused. The authors described logistical details of moving the USMLE Step 1, including issues related to timing and relevant curricular features. Among these eight schools, there was not one way of implementing this change, and some schools are flexible with the amount of time they allow for studying and completing the examination. In addition, schools incorporated a variation of learning platforms and activities to facilitate student retention of basic science knowledge. All schools that have already made this change and those that have USMLE Step 1 score data for students who completed the examination before and after the core clerkships reported some increase in aggregate scores, though these differences may not be statistically significant and are not generalizable. An unanticipated outcome experienced by schools that are flexible in when students can take the USMLE Step 1 reported that allowing students' independence in choosing when they take the examination caused students anxiety with the lack of available data to inform their decision. Additional empirical studies need to be conducted to understand examination score differences for students who completed the examination before and after the core clerkships. Specific attention needs to be given to both low and high performing students, as well as both class and individual differences in the context of each school's curriculum. This article fills a gap in informing medical schools of the facilitators and barriers to making this change, as more educators are advocating for individualized experiences and competency-based curricula.

**Deiorio NM, Carney PA, Kahl LE, Bonura EM, Juve AM. Coaching: A new model for academic and career achievement. *Med Educ Online*. 2016;21:33480.**

This article discusses the need for definitions and constructs for academic coaching in medical education, in order to accurately assess the coaching relationship and processes. The purposes of the article are to (1) define the concept of coaching and create a conceptual framework applied to medical education and (2) identify and define constructs for measurement. As medical knowledge continues to expand, physicians must become skilled in identifying gaps in knowledge and skills and continually embark on cycles of self-improvement. Coaching is emerging as a potential approach to facilitate this process, and it represents a shift from traditional advising and mentoring. With these proposed definitions and constructs further research should be conducted to examine how to measure the coaching relationship and process and its effects on learning outcomes, lifelong self-directed learning, and overall academic development at varying skill levels. This article informs the work of health professions education programs seeking to implement or improve coaching programs.

**Deiorio N, Juvel AM. Developing an academic coaching program. *MedEdPublish*. 2016.**

This article presents recommendations for building a coaching program through review of the literature and the authors' own experiences. A clear definition of academic coaching as a developmental longitudinal relationship distinct from advising, mentoring, and teaching is the foundation on which this concept should be introduced to faculty and learners. In addition, faculty with the right skills, not content expertise, should be selected as academic coaches, as learners also need to be developed to be coached. Likewise, coaches also need to be prepared to help learners navigate their academic experience. It is also helpful to keep a regular schedule for both meetings between the coach and learner, as well as for faculty development to provide coaches with evidence-based resources and feedback on their coaching. With regard to assessment data, electronic portfolios can be used to as a tool to make assessment information readily available and transparent to coaches. However, in this capacity it is not recommended that coaches also act as assessors. Lastly, it is necessary to acknowledge faculty members as coaches and support them through creating an environment in which they can learn from each other, as well as other coaching programs. One way to sustain a coaching program's growth is through a deliberate evaluation process that measures progress on high-lev-

el outcomes. These recommendations contextualize academic coaching within health professions education, creating a framework that institutions can use when implementing and developing new coaching programs.

**Denny JC, Spickard A, Speltz PJ, Porier R, Rosenstiel DE, Powers JS. Using natural language processing to provide personalized learning opportunities from trainee clinical notes. *J Biomed Inform*. 2015;56:292-299.**

This article describes a novel electronic adviser system using natural language processing (NLP) to identify two geriatric medicine competencies from medical student clinical notes in the electronic health record (EHR). Clinical notes from third year medical students were processed using a general-purpose NLP system to identify biomedical concepts and their section context. The system analyzed these notes for relevance to the competencies and generated custom email alerts to students with embedded supplemental learning material customized to their notes. In total, 393 emails were sent to 54 students (82% enrolled), including 270 for one competency and 123 for the other. The system selected and emailed links to 260 unique documents from the medical school curriculum in the 393 adviser emails sent to students, with some documents being included by design. Students accessed educational links 34 times from the 393 email alerts. Although the system had a small effect in changing behavior, the advantage of this assessment is that it is measuring real clinical change in documentation. Given the low cost and burden of such a system, these education advisers may be a useful adjunct to other forms of instruction. This article provides an example of how NLP has been used within an EHR-based intervention to provide students feedback outside of the potentially time-pressured clinical environment. As some schools are considering new information that can be integrated into EHRs for teaching and practice, this article provides an example of how competencies may be evaluated using NLP in EHR-based interventions.

**Elks ML, Herbert-Carter J, Smith M, Klement B, Knight BB, Anachebe NF. Shifting the curve: Fostering academic Success in a diverse student body. [published online ahead of print July 3, 2017]. *Acad Med*. doi:10.1097/ACM.0000000000001783**

This article describes a process that resulted in a high level of academic success for a diverse student body at the Morehouse School of Medicine (MSM), a historically black medical school. On average, about 75% of matriculating students are African-American and 5% are from other underrepresented groups in medicine. Their entering grade point averages (GPA) and Medical College Admission Test (MCAT) scores are similar to those reported nationally by race/ethnicity, but their United States Licensing Examination (USMLE) Step 1 scores are higher than expected based on their MCAT. To understand which factors contribute to their success on the USMLE Step 1 the authors first compared their students' MCAT scores to the national average for each cohort. Next, the authors determined scores from the students' first attempt at the USMLE Step 1 and calculated correlation coefficients comparing the MCAT scores to the USMLE Step 1 scores for each class. Next, they used a formula from the literature to predict students' USMLE Step 1 scores based on their GPA and MCAT scores, and their students' scores were 22.6 points higher than the calculations predicted. Lastly, they collected data from course evaluations, an annual questionnaire, and interviews and focus groups with faculty members and students to understand which factors influenced these outcomes. Based on their qualitative analysis, the authors believe this success can be attributed to the milieu and mentoring at the school, structure and content of the curriculum, and monitoring. At MSM, faculty and peer supports are offered through longitudinal learning communities that begin in the students' first year of medical school. In addition, MSM has several mechanisms in place to provide feedback to students and continuous quality improvement for faculty. Several mixed methods studies are underway to more closely examine the factors identified. This report, and future studies, will help other educational programs facilitate environments that lead to successful outcomes for a diverse student body.

**Ellaway RH, Pusic MV, Galbraith RM, Cameron T. Developing the role of big data and analytics in health professional education. *Med Teach*. 2014;36:216-222.**

This article reviews the potential of educational analytics and big data in health professional education and makes recommendations for how these techniques can be developed to serve all stakeholders. Big data involves the aggregation of large and heterogeneous data sets. A few examples of how big data can be used are increasing personalized competency data at the individual learner level; a longitudinal capture of data from a single institution from multiple sources, times, and cohorts; parallel capture of data across different institutions at a single time point; combining longitudinal and cross-sectional data; and combining data from educational and clinical information repositories. Likewise, educational analytics are used to look for patterns in educational practice or performance, although it is unclear how big data should be used to guide both learners and institutions in making decisions. Additionally, it is important to remember that big data is open to bias and misinterpretation no less than traditional methods of research, evaluation, or assessment. This article informs the health professions educators' efforts in developing large data sets to measure the impact of innovations over time. As the researchers and evaluators build data sets, it is important to be cognizant of the purpose, methods, and challenges articulated in this article.

**Ehrenfeld JM, Spickard WA, Cutrer WB. Medical student contributions in the workplace: Can we put a value on priceless? *J Med Syst*. 2016:40;128**

This article discusses the need for a series of research projects to assess the value of medical student contributions in patient care and health care settings in which they train and participate. A few challenges to measuring value are a lack of a shared understanding of how to define either value or contributions and understanding the contributions of a single team member. This article proposes that it would be helpful to define nomenclature around medical student contributions. This article sets a foundation in medical education to enable stakeholders to quantify contributions across settings and roles. This work would solidify faculty expectations of students and inform appropriate assessments of their contributions.

**Epstein-Lubow G, Cineas S, Yess J, Anthony D, Fagan M, George P. Development of a longitudinal integrated clerkship at the Warren Alpert Medical School of Brown University. *R I Med J*. 2015;98:27-31.**

This article describes the introduction of a longitudinal integrated clerkship (LIC) by the Warren Alpert Medical School of Brown University. The LIC is a method of clinical medical education in which traditional specialty-specific block rotations lasting several weeks and occurring sequentially are replaced by longitudinal experiences for all core specialties occurring concurrently over many months and largely in the outpatient setting. The LIC is for third year students in the primary care-population medicine program. In developing the LIC, program faculty incorporated a historical perspective of medical education, modern knowledge about students' development of clinical skills, and educational science as it relates to faculty development and learner evaluation. The clerkship is being tailored to fit the

Brown University system as it will be unique in its attention to population medicine, including exposure of students to several distinct health care systems within a single geographic region, and integration of clinical training with completion of a Master in Population Medicine. The goals are to gain longitudinal experience in each of six core clerkships; promote continuity with patients and their care environments; integrate population health with clinical medicine; longitudinally follow and participate in treatments of patients across specialties; and complete a quality improvement and/or patient safety project focused on population medicine. For the 2015-2016 academic year the LIC was a pilot and was the required core clinical education for medical training for eight selected students. Based on assessments of the program and students' performance, the LIC will be adjusted to better aid student learning and overall functioning of the LIC program within affiliated health care systems. This article informs medical schools interested in implementing a LIC while deliberately integrating topics related to population medicine.

**Erlich M, Blake R, Dumenco L, White J, Dollase RH, George P. Health disparity curriculum at the Warren Alpert Medical School of Brown University. *R I Med J*. 2014;97:22-25.**

This article discusses the health disparity curriculum that has been implemented at Warren Alpert Medical School of Brown University. In addition to acquiring knowledge of basic sciences and clinical skills, medical students must gain an understanding of health disparities and develop a defined skill set to address these inequalities. Using Kern's six-step approach to curriculum development along with principles of experiential and active learning, student champions and the office of medical education developed a multimodal health disparities curriculum. This curriculum includes required experiences for medical students in the first, second and third years, along with elective experiences throughout medical school. Students are examined on their knowledge, skills and attitudes toward health disparities prior to graduation. The goal of this curriculum is to empower students with the knowledge, skills and attitudes to help patients navigate the socio-economic and cultural issues that may affect their health. This article describes the challenges moving forward in creating a broader interest in health disparities to strike the appropriate balance between providing students with a strong biomedical foundation of knowledge and gaining deep understanding of social influences that often drive health outcomes. This article informs the consortium's work on understanding this balance, as well as providing additional strategies for teaching health disparities.

**Farrell SE, Hopson LR, Wolff M, Hemphill RR, Santen SA. What's the evidence: A review of the one-minute preceptor model of clinical teaching and implications for teaching in the emergency department. J Emerg Med. 2016;51:278-283.**

This article reviews the evidence for the effectiveness of the one-minute preceptor (OMP) teaching method and provides suggestions for its use in emergency medicine. The OMP was first introduced in the family medicine literature as a method to simultaneously teach clinical skills and provide patient care. Existing experimental studies support faculty and resident educators in using OMP as an effective clinical teaching method with multiple benefits. In utilizing the OMP, teachers are able to identify gaps in the student's learning, engage the learner in higher level clinical thinking, contextualize learning about specific issues, improve the level of feedback given to the learner, as well as address the patient's needs. Lastly, the authors use a case to illustrate how the OMP method may be applied in emergency medicine. This article articulates the potential for OMP to be used in a new clinical setting and context. This article informs medical education programs that seek to incorporate new assessment methods by demonstrating the use of the OMP in settings that are not common for this assessment method.

**Favreau MA, Tewksbury L, Lupi C, et al. Constructing a shared mental model for faculty development for the Core Entrustable Professional Activities for Entering Residency. *Acad Med*. 2017;92:759-764.**

This article provides an analysis of the current literature on entrustable professional activities (EPA) and entrustment to determine a framework for developing faculty to make entrustment decisions. The authors determined that such a framework is composed of four dimensions. First, observation skills in authentic work environments should be developed in order for assessment and entrustment to occur as a partnership between the faculty and learner in order to facilitate the learner's development. Second, feedback and coaching skills should be included as part of faculty development programs to assist faculty in creating longitudinal coaching relationships in which the faculty and learner reciprocate trust. Third, faculty development should include opportunities to continuously improve their understanding and ability to self-assess and reflect in order to demonstrate these behaviors and skills to learners throughout the entrustment process. Lastly, it is necessary to create a community of practice in which all individuals involved in the entrustment process are given opportunities to learn from other faculty through a collaborative process fostering optimal contributions from faculty and an EPA culture. In addition, the authors describe factors related to organizational structure that make it more difficult to establish such a culture within a medical school environment compared to residency. Medical schools may use the suggestions and framework described in this article to develop an EPA culture at their institution by focusing on faculty development efforts that are necessary for successful implementation.

**Fenton JJ, Fiscella K, Jerant AF, et al. Reducing medical school admissions disparities in an era of legal restrictions: Adjusting for applicant socioeconomic disadvantage. *J Health Care Poor Underserved*. 2016;27:22-34.**

This article discusses the need for a diverse physician workforce in order to increase access to care for underserved populations. Medical schools have compelling reasons for achieving class diversity. First, student diversity enhances the education of all students. Second, in workforce analyses, non-white students are more likely than white students to provide care in underserved communities after medical training. Third, a diverse physician workforce may help address racial/ethnic and socioeconomic disparities in health status, health care quality, and in patient recruitment for health research. Lastly, medical students value diversity. The authors also discuss the legal restrictions that constrain the extent to which medical schools may use race/ethnicity in admissions decisions and outlines simulations conducted using academic metrics and socioeconomic data from applicants to a California public medical school from 2011 to 2013. These results indicated socioeconomic and under-represented minority disparities in admissions could be eliminated while maintaining academic readiness. Adjusting applicant academic metrics using socioeconomic information on medical school applications may be a race-neutral means of increasing the socioeconomic and racial/ethnic diversity of the physician workforce. This article offers an approach that other medical schools may use to mitigate disparities in admissions.

**George P, Tunkel AR, Dollase R, et al. The primary care-population medicine program at the Warren Alpert Medical School of Brown University. *R I Med J*. 2015;98:16-21.**

This article discusses the primary care-population medicine (PC-PM) program developed by the Warren Alpert Medical School of Brown University. The program builds upon the traditional curriculum with major integrated curricular innovations. The first innovation is the Master of Science in Population Medicine that requires students to take nine additional courses over four years, complete a thesis project focused on an area of population medicine, and take part in significant leadership training. The second is the development of the longitudinal integrated clerkship (LIC) during the third year of medical school in which the students complete a longitudinal outpatient experience with the same preceptors and patients. During the LIC the students follow a panel of patients wherever care is provided, while focusing on population health and health care delivery issues, in addition to medical topics throughout their clinical and didactic experiences. The PC-PM pilot began August 2015 with a class of 24 students. This article describes an approach to advance primary care and population medicine education that may be adapted by other medical schools.

**Gonzalo JD, Haidet P, Wolpaw DR. Authentic clinical experiences and depth in systems: Toward a 21st century curriculum. *Med Educ*. 2014;48:104-112.**

This article describes a program that began in 1952 and introduced increased learner responsibility, an organ system-based curriculum, and early student engagement in patient care through a family clinic. This program linked medical students with pregnant women and created a meaningful mini-immersion for these pre-clerkship students. The students followed the women through pregnancy, delivery and postnatal care, and infants into early childhood. The students attended all appointments, made home visits, and often developed important longitudinal relationships with mother, child and family, actively contributing to these patients' health care. Over time the program morphed into a more typical preceptorship, in which students gained the opportunity to practice clinical skills and see a greater number of patients, but without the depth afforded by the original program. This article discusses how the changes caused the program to lose the meaningful engagement that promotes learning and professional development. It also emphasizes the importance of systems-based experiences to student development. The author's focus on a new systems-based curriculum sets a foundation within the medical education literature for future study and adaptation of such curricula.

**Gonzalo JD, Haidet P, Papp KK, et al. Educating for the 21st-Century Health Care System: An interdependent framework basic, clinical, and systems sciences. *Acad Med*. 2017;92:35-39.**

This article examines the current state of medical education with respect to systems science. The framework proposed represents an educational shift from a two-pillar framework to a three-pillar framework where basic, clinical, and systems sciences are interdependent. In this new framework students not only learn the interconnectivity of the basic, clinical, and systems sciences but also uncover relevance and meaning in their education through authentic, value-added, and patient-centered roles as navigators within the health care system. This article discusses the implementation of the new curriculum at Pennsylvania State University College of Medicine, called the Systems Navigation Curriculum (SyNC). This curriculum consists of conceptual and experiential components: (1) the Science of Heath Systems course, and (2) patient navigator experiences. Both the course and the navigation experiences allow students to develop the knowledge, attitudes, and skills to function effectively amid the complexities of an evolving health care system. The Science of Health Systems Course spans the first seventeen months of the students' undergraduate experience and is simultaneous with course work in basic and clinical sciences. This article's proposal of the three-pillar framework and the SyNC curriculum informs ongoing work toward integrating health systems science as the third pillar of medical education.

**Gonzalo JD, Dekhtyar M, Starr SR, et al. Health systems science curricula in undergraduate medical education: Identifying and defining a potential curricular framework. *Acad Med*. 2017;92:123-131.**

This article describes a review of 30 Accelerating Change in Medical Education full grant submissions and analysis of health systems science (HSS)-related curricula at 11 schools to develop a potential comprehensive HSS curricular framework with domains and subcategories. In phase 1 of this project, full grant submissions were analyzed and coded to identify domains. In phase 2, a detailed review of all existing and planned syllabi and curriculum documents at the grantee schools was performed. The final analysis yielded three types of domains: core, cross-cutting, and linking. Core domains included health care structures and processes; health care policy, economics, and management; clinical informatics and health information technology; population and public health; value-based care; and health system improvement. Cross-cutting domains included leadership and change agency; teamwork and interprofessional education; evidence based medicine and practice; professionalism and ethics; and scholarship. Systems thinking was identified as a linking domain. This article includes definitions, examples, and subdomains for each of the identified domains. This broad framework aims to build on the traditional definition of systems-based practice and highlight the need to better align education programs with the anticipated needs of the systems in which students will practice. This article informed the HSS textbook content and HSS examination blueprint. This framework may also serve as a guide for future identification and development of HSS curricula and faculty development opportunities and may assist in helping educators understand gaps in assessment.

**Gonzalo JD, Baxley E, Borkan J, et al. Priority areas and potential solutions for successful integration and sustainment of health systems science in undergraduate medical education. *Acad Med*. 2017;92:63-69.**

This article discusses the call for significant reform to undergraduate medical education (UME) and graduate medical education (GME) programs to meet the evolving needs of the health care system. Nationally, several schools have initiated innovative curricula to promote education in health systems science (HSS). However, the successful implementation of HSS curricula is challenged by issues of curriculum design, assessment, culture, and accreditation. The authors describe seven priority areas for the successful integration and sustainment of HSS in educational programs, associated challenges, and potential solutions. The authors identified these priority areas: partner with licensing, certifying, and accrediting bodies; develop comprehensive, standardized, and integrated curricula; develop standardize, and align assessments; improve the UME to GME transition; enhance faculty knowledge and skills, and incentives; demonstrate value-added to the health system; and address the hidden curriculum. This article may serve as a blueprint for health professions education programs interested in developing HSS curricula locally, as well as for national efforts focused on promoting HSS-related knowledge, skills, and attitudes through national initiatives.

**Gonzalo JD, Graaf D, Johannes B, Blatt B, Wolpaw DR. Adding value to the health care system: Identifying value-added systems roles for medical students. *Am J Med Qual*. 2017;32:261-270.**

This article identifies potential value-added roles for medical students within the health care delivery system, as well as the perceived value of medical students contributing in that capacity. Value-added roles are authentic experiences and opportunities for medical students to add value to the health system by contributing to patient care and improving patient outcomes, in turn helping them learn about health systems science. The research team identified over 30 clinical sites to accommodate more than 150 medical students. Participating clinical sites included inpatient and outpatient settings, clinics, and programs that were geographically distributed and included multiple specialty programs. Through site visits and key informant interviews, the authors identified potential system roles needed to improve patient outcomes, as well as perceived barriers that patients may experience. Potential systems tasks were identified as being either direct patient benefit activities or direct clinic benefit activities. This article provides a foundation to further explore experiential opportunities that add value to the health system and teach students about health systems science.

**Gonzalo JD, Haidet P, Blatt B, Wolpaw DR. Exploring challenges in implementing a health systems science curriculum: A qualitative analysis of student perceptions. *Med Educ*. 2016;50:523-531.**

This article describes students' perceptions of learning health systems science in the context of an institution that implemented a 17-month course with an estimated 125 contact hours. This course included two primary components: classroom activities learning about systems-related topics not limited to insurance, cost, teamwork, and leadership, as well as an experiential patient navigation experience in which students were embedded within clinical sites. Focus groups were conducted with students in all four years of school. Researchers identified four categories of student-identified barriers, ranging from a lack of support for systems education to the importance of basic science on medical licensing board examinations. Likewise, student-identified benefits of a systems curriculum included the acquisition of health systems science knowledge and skills, a better understanding of the patient experience, and improved learning and engagement in their patient navigator roles. However, the unifying challenge for medical students is negotiating two competing agendas—that of the medical education system placing importance on basic science and examinations and their own desire of being the best physician possible. This article provides a foundation for future research exploring the tensions described, and provides important insights about student perceptions of health systems science.

**Gonzalo JD, Lucey C, Wolpaw T, Chang A. Value-added clinical systems learning roles for medical students that transform education and health: A guide for building partnerships between medical schools and health systems. *Acad Med*. 2017;92:602-607.**

This article discusses the large-scale efforts to develop novel required longitudinal, authentic health systems science curricula in classrooms, in workplaces, and for all first-year students. The authors combined two models in an intersecting manner, using Kotter's change management and Kern's curriculum development steps. The three-pillar framework that emerged addresses the challenges of reform at the undergraduate medical education level in regards to physician readiness for practice and leadership in changing health systems and integrates the biomedical and clinical sciences with health systems science. Applying this framework can lead to value-added clinical systems learning roles for students, meaningful medical school-health system partnerships, and a generation of future physicians prepared to lead health systems change. This article provides a framework for medical schools working toward integrating medical students into authentic, value-added roles through increased collaboration with health systems.

**Gonzalo JD, Graaf D, Kass LE, Promes SB, Wolpaw DR, George DR. Medical students as systems ethnographers: Exploring patient experiences and systems vulnerabilities in the emergency department. *AEM Educ Train*. 2017;1:225-233.**

This article describes an ethnography experience for select first-year medical students in an Emergency Department (ED). The goal of this educational program was to design systems ethnography roles that could enhance learning about health systems and to identify strategies for other programs interested in implementing systems ethnography roles for medical students in clinical settings. Medical students attended a session on ethnography theory and methods and systems thinking prior to participating as ethnographers. Students were connected with patients, observed health care delivery for 12-15 total hours over a six-week period, and worked in teams to discuss barriers, facilitators, and ways to improve processes in the ED. At the end of the experience each student submitted a one- to two-page assignment discussing their observations, thoughts, and issues explored from the patient's perspective regarding ED processes. Notes were taken of discussions that occurred during report-outs at the debriefing session. Lastly, students completed a survey about their perceptions of the experience. A thematic analysis was conducted on assignments and notes collected using previously published frameworks in order to categorize systems vulnerabilities. The overarching theme identified was the dichotomy between the monotonous patient experience and the fast-pace environment of the ED. In addition, the researchers identified four categories of systems vulnerabilities: patient experience; communication and collaboration; processes, physical space, and resources; and professionalism. Overall, students found the experience to be valuable and felt that their understanding of the patient experience increased. Lastly, qualitative analysis of open-ended questions showed that students had a larger appreciation for processes and issues that arise in the ED, and the analysis demonstrated the students' ethnography and systems thinking skills. This study demonstrates the value-add of first-year medical students in clinical settings to both educational and clinical missions. The authors also describe the approaches and challenges of accomplishing objectives, which may be useful to other programs interested in embedding students within clinical settings.

**Gonzalo JD, Thompson BM, Haidet P, Mann K, Wolpaw DR. A constructive reframing of student roles and systems learning in medical education using a communities of practice lens. [published ahead of print June 20, 2017]. *Acad Med*. doi:10.1097/ACM.0000000000001778.**

This article uses community of practice theory to understand the implications that value-added medical education, authentic student roles, and health systems science may have in changing educational practices and student experiences. Community of practice theory describes knowledge management within a community in which members with similar goals and barriers share experiences to improve their knowledge and skills. In improving student role experiences for medical students within a community of practice, four questions need to be considered: who is within the community; in what context do students learn within the community; what domain of knowledge is being taught through experiences within

the community; what opportunities exist for students to authentically contribute within the community? Communities of practice for physicians have traditionally been considered to consist of peers, residents, and senior physicians. However, health care system transformations have expanded the community to include interprofessional team members, patients, and populations. In the context of increasing student engagement, students may also enter this community to engage with and learn within a diverse collaborative setting. Health care stakeholders are identifying gaps in physicians' knowledge of health systems. As such, student involvement in this type of a community of practice would operationalize health systems science knowledge domains through their roles and experiences, which would begin as small tasks and gradually increase to full participation through their experience in becoming physicians. Additionally, the authors examine these factors of communities of practice within common student educational settings: clinical preceptorships, service learning experiences, student-run free clinics, and value-added clinical systems learning roles. They explain that value-added clinical systems roles may offer students the most legitimate experiences to develop a professional identity that aligns with the evolving physician expectations. However, processes need to be created to continuously improve these experiences leading to student buy-in. This article provides an additional theoretical framework that may be used as a foundation for future research evaluating the utility of and student experiences within value-added roles in medical education.

**Greer PJ, Brown DR, Brewster L, et al. Socially accountable medical education: An innovative approach at Florida International University Herbert Wertheim College of Medicine. [published online ahead of print June 27, 2017]. *Acad Med*. doi:10.1097/ACM.0000000000001811.**

This report describes a service learning experience at the Herbert Wertheim College of Medicine Florida International University called the Green Family Foundation Neighborhood Health Education Learning Program, which aligns with the school's mission to create socially-accountable physicians. In this program, interprofessional teams of students and faculty are assigned to households with the goal of identifying and addressing their social determinants of health longitudinally. Community needs were determined based on the results of a door-to-door survey of 1,845 households. A network of academic-community partners was formed to create an infrastructure that facilitates all aspects of care for these households, from identifying their social determinants to advocating for their specific needs. Community capacity and trust is built through a community engagement processes in which staff work with the community to recruit, enroll, and better advocate for their needs. Household logistics, including scheduling and management of social determinants, is maintained with the use of an electronic portal. After students develop rapport with a household they develop a care plan and are responsible for providing or referring household members to services, as well as following up on progress. In addition to the portal, household progress is tracked using an electronic medical record. Furthermore, these service learning experiences are integrated within the educational (curriculum) and social (learning communities) structures of the medical school and are sustained with funding, which allows these experiences to be an integral part of faculty members' teaching role. Household surveys indicated participants decreased emergency department visits and began to take on preventive health measures after the first two years of the program. In collaboration with law students and faculty, this program also assisted households in securing direct financial benefits. Next, the medical school aims to understand the development of entrustment for medical students working with interprofessional teams. They will also better integrate social accountability competencies and social determinants cases throughout the curriculum. Lastly, the medical school is developing a system to evaluate individual, household, program, and system level impact and is integrating informational technology systems to display social determinants information within the electronic medical records. Health professions education programs may use this service learning model to increase exposure to and the quality of interprofessional learning experiences.

**Gruppen LD, Burkhardt JC, Fitzgerald JT, et al. Competency-based education: Programme design and challenges to implementation. *Med Educ*. 2016;50:532-539.**

This article describes the design of and challenges to implementing a competency-based education (CBE) program in the context of a Master of Health Professions Education program at one medical school. The authors use an existing definition which identifies a focus on outcomes, an emphasis on abilities, a reduced emphasis on time-based training, and the promotion of learner centeredness as four distinct features of CBE. In addition, the program utilizes entrustable professional activities (EPA) for learning and assessment to support an individualized curriculum. A decreased emphasis on time-based training is identified as the facet of CBE programs that is slowest to be adopted, with most programs using competency-based assessment to validate student competence, rather than as a method of progression through a program. The program described in this paper follows the defined CBE model very closely by mapping EPAs to educational competencies to track learner assessment. Learner experiences are aligned with their professional roles and previous experience can be accounted for if demonstrating proper completion of an EPA. However, in implementing this CBE program challenges were encountered: feedback is more difficult to provide as students are used to assessment being a form of evaluation and not a guide to learning; the traditional university paradigm of administrative structures related to registration, tuition, etc., are not conducive a CBE program; individualization requires more time to collaboratively design a learning program; and community building within the program is harder to achieve because of the program's emphasis on asynchronous learning. This article informs education programs interested in implementing CBE. The program described in this article serves as an example of how a CBE program in medical school could be structured.

**Gruppen LD, Stansfield RB. Individual and institutional components of the medical school educational environment. *Acad Med*. 2016;91:S53-S57**

This study sought to understand the dynamic relationship between individual and institutional components to the learning environment as well as their relative contributions. The authors utilized data from the American Medical Association's Learning Environment Study, which included student perceptions of the learning environment through administration of the Medical School Learning Environment Scale (MSLES). Hierarchical linear models were used to estimate the variance of MSLES scores with both individual and institutional factors. In the models, individual-level factors included sex, minority status, and the amount of time between the students' completion of their undergraduate program and matriculation into medical school. Additionally, psychosocial factors were included, such as perceptions of clinical empathy, patient-centeredness, and tolerance of ambiguity scores that were all collected at matriculation. Institution-level factors in the model included the number of students enrolled, in-state tuition, average Medical College Admission Test scores, and percentage of applicants accepted. All institution-level information was found online. Overall, this study found that learning environment ratings were accounted for more by individual-level factors than institution-level factors. Although some

individual differences are due to perceptions, others reflect the different environments that may occur within a single school. Although empathy was found to have a strong relationship with MSLES scores in this study, it is evident through this model that many other individual characteristics influencing perceptions of the environment have yet to be identified. This study extends the medical education community's understanding of the learning environment and gives direction for additional research needed to understand this complex, multi-faceted construct.

**Hauer KE, Boscardin C, Fulton TB, Lucey C, Oza S, Teherani A. Using a curricular vision to define entrustable professional activities for medical student assessment. *J Gen Intern Med*. 2015;30:1344-1348.**

This article describes the process that the University of California, San Francisco, School of Medicine set in motion to design entrustable professional activities (EPAs) for assessment in a new curriculum and to gather evidence of content validity. This project included the participation of nineteen medical educators, in which fourteen completed both rounds of a Delphi survey. The article discusses the five steps for defining EPAs and assessment strategies; defining competencies and milestones; and mapping milestones to EPAs. A Q-sort activity and Delphi survey involving local medical educators established consensus and prioritization for milestones for each EPA. For four EPAs, most milestones had content validity indices (CVIs) of at least 78%. For two EPAs, two to four milestones did not achieve CVIs of 78%. The article describes a stepwise procedure for developing EPAs that capture essential physician work activities defined by curricular vision, as well as structured procedures for soliciting faculty feedback and mapping milestones to EPAs that provide content validity. This article informs health professions educators interested in developing and improving EPAs, milestones, and competencies.

**Hawkins RE, Welcher CM, Holmboe ES, et al. Implementation of competency-based medical education: are we addressing the concerns and challenges? *Med Educ*. 2015;49:1086-1102.**

This article discusses competency-based medical education (CBE) emerging as a core strategy to educate and assess the next generation of physicians. The advantages of CBE include a focus on outcomes and learner achievement; requirements for multifaceted assessments that embrace formative and summative approaches; support of a flexible, time-independent trajectory through the curriculum; and increased accountability to stakeholders with a shared set of expectations and a common language for education, assessment and regulation. Despite the advantages of CBE, numerous concerns and challenges have been described such as increased administrative requirements; the need for faculty development; the lack of models for flexible curricula; and inconsistencies in terms and definitions. The article summarizes responses from the education community regarding the CBE concerns and challenges. The issues with implementation of CBE have begun to be addressed by the education community. Models and guidance exist to inform implementation strategies across the continuum of education and focus on the more efficient use of resources and technology as well as the use of milestones and entrustable professional activities-based frameworks. CBE definitions and frameworks remain a significant obstacle. Much work remains to bring rigor and quality to workplace based assessment. The article's focus on CBE implementation informs gaps in the health professions education literature.

**Hersh WR, Gorman PN, Biagioli FE, Mohan V, Gold JA, Mejicano GC. Beyond information retrieval and electronic health record use: Competencies in clinical informatics for medical education. *Acad Med.* 2014;5:205-212.**

This article describes an expanded curriculum at one medical school that includes a comprehensive set of 13 medical informatics competencies. A broad set of competencies was developed using an exploratory qualitative methodology. A set of learning objectives was developed for each competency. A time in the curriculum at which each concept should be taught was assigned, and each learning objective was mapped to an Accreditation Council for Graduate Medical Education competency. In addition, designations were made of where specific learning activities would take place during specific parts of the curriculum from the first to the last year of medical school. Future needs for sustaining an integrated medical informatics curriculum include the development of evaluation tools for the competencies and activities, collaboration between informatics specialists and clinical educators to design and implement learning experiences, and a longitudinal evaluation of the implementation of medical informatics competencies described in this article. This article informs medical education programs by providing a foundation of medical informatics competencies that may be integrated within a clinical and health systems science curriculum.

**Hortsch M, Mangrulkar RS. When students struggle with gross anatomy and histology: A strategy for monitoring, reviewing, and promoting student academic success in an integrated preclinical medical curriculum. *Anat Sci Educ*. 2015;8:478-483.**

This article discusses barriers and strategies to teaching anatomy and histology within an integrated curriculum at one medical school. Medical school curricula are changing to make preclinical coursework relevant to the clinical experience, which may present new challenges to students. Although some schools have established strategies to improve student performance, there is not one clear method for student remediation. Furthermore, anatomy and histology have unique barriers for learners that may also vary based on the learner's strengths. Specifically, it may be more difficult to identify struggling students early in their education within an integrated curriculum where these content areas are dispersed longitudinally. At the University of Michigan Medical School students receive lectures and are regularly assessed on their ability to apply what they have learned in their organ-based sequences as it relates to anatomy and histology. Images used on the examinations are not ones that students have seen before, requiring increased analytical ability to interpret images and apply them to facts and processes. Students struggling in anatomy have similar difficulties in other aspects of their academic learning, but most students will find helpful strategies to learn this material and develop these skills. At this school, struggling students are typically identified through a Basic Science Academic Review Board, program directors, or a learning support team. Directors of individual sequences may have trouble identifying struggling students because each sequence only lasts a few weeks. Struggling students are typically advised to: utilize learning objectives to focus their learning; deliberately plan how to use available resources; attend lectures in person rather than listening to the audio or attending virtually; better prepare for lab sessions; and improve test taking skills for each subject. However, it may still take a few months for a review board to synthesize early assessment information to identify struggling students, and, at that point, other issues may arise or the student may be hesitant to seek help, delaying the improvement process for students who require assistance.

**House J, Sun JK, Sullivan A, Ross P. Introduction to interprofessional education using health professionals. *Med Educ*. 2016;50:564-591.**

This article describes the characteristics and outcomes of an interprofessional education program with the goal of preparing students to work within a care team. Students completed a quiz at the

beginning of the first year prior to attending small-group sessions with various health care professionals (not limited to social worker, dietician, respiratory therapist), and the discussions were based on the results of the quizzes. To give context to the discussions, health professionals showed a video depicting an emergency department visit and students learned about their different roles. The students and health professionals involved felt that this was a valuable opportunity for medical schools to engage and learn about the roles and education of other professionals in the health care setting. Similar programs at health professions institutions may be developed to address curricular gaps in interprofessional education.

**Leep Hunderfund AN, Dyrbye LN, Starr SR. Role modeling and regional health care intensity: U.S. medical student attitudes toward and experiences with cost-conscious care. *Acad Med*.2017;92:694-702.**

This article describes a survey distributed to students at 10 different medical schools to examine their attitudes toward cost-conscious care and whether regional health care intensity is associated with reported exposure to physician role-modeling behaviors related to cost-conscious care. Regional health care intensity was measured using Dartmouth Atlas End-of-Life Chronic Illness Care data, ratio of physician visits per decedent compared with the U.S. average, ratio of specialty to primary care physician visits per decedent, and hospital care intensity index. In adjusted linear regression analyses, students in higher-health-care-intensity regions reported observing significantly fewer cost-conscious role-modeling behaviors. For each one-unit increase in the three health care intensity measures, scores on the 21-point cost conscious role-modeling scale decreased. The results from the survey concluded that medical students encounter conflicting role-modeling behaviors, which are related to regional health care intensity. This article informs medical educators by providing insight to how enhancing role modeling in the learning environment may help prepare future physicians to address health care costs.

**Leep Hunderfund AN, Reed DA, Starr SR, Havyer RD, Lang TR, Norby SM. Ways to write a milestone: Approaches to operationalizing the development of competence in graduate medical education. [published online ahead of print on March 28, 2017]. Acad Med. doi:10.1097/ACM.0000000000001660.**

This study examines approaches to articulating competence within the Accreditation Council for Graduate Medical Education's (ACGME) milestones across different core competencies. ACGME milestone project documents were used in this analysis, and each subcompetency was examined to understand the development of competence within the milestones. The authors conducted an inductive analysis of the milestones to identify different approaches. When no new approaches were identified, different methods were compared across the core competencies. Fifteen approaches were identified through this analysis and grouped into four categories to depict whether the methods used focused on the learner, the context, social interactions, or the supervisor. Focus on the learner was the largest category identified, and approaches in this group described the learner's ability to perform different tasks that became increasingly difficult, to improve performance or speed of a task, progression from performing parts of a task to the whole task, consistent demonstration of a behavior or skill, attitudes toward certain activities, or the progression of knowledge or ability. Furthermore, approaches focusing on context were described in terms of the type of situation that the learner is presented with. Additionally, approaches focused on social interactions identified progressions of the learner's ability to teach, lead, role model, or consult. Lastly, the approach focused on the supervisor described the learner's increasing ability to perform independently. This study also identifies how multiple approaches were utilized within milestones that describe a subcompetency, as well as specific methods that were common among each core competency. An understanding of different conceptual frameworks and approaches used to develop milestones may assist in improving future milestones, as well as guide educators in developing new milestones for emerging content areas.

**Lewis JH, Whelihan K, Navarro I, Boyle KR, and SDH Card Study Implementation Team. Community health center provider ability to identify, treat and account for the social determinants of health: A card study. *BMC Fam Pract*. 2016;17:121.**

This study examines community health center provider perceptions of the impact of social determinant of health (SDH) factors on their patients, as well as the providers' capacity to address and code for services that focus on SDH. This research utilized a card study approach to collect real-time data about patient care. Practitioners complete these cards during their patient encounters. The cards included 16 SDH that are not commonly collected as part of a routine social history. All centers used as the settings for this study were Federally Qualified Health Centers, which were rural in California and urban in Illinois and New York. Providers' perceptions of their understanding and ability to identify SDH, perceptions of the importance of SDH, and perceptions of community health center resources, and rate of referral was assessed using a 5-item pre-study survey. After the survey, providers received a lecture on SDH and training on how to complete the card. Qualitative data regarding the providers' ability to identify and address SDH, as well as their perceptions of specific SDH were collected on the cards. Pre-study surveys were completed by 43 providers, and results indicated that they were familiar with and viewed SDH as important factors that affect their patients' health. Although they indicated that they often refer their patients to resources, they also indicated neutrality regarding availability of resources. Out of 747 patient encounters, only 34 patients did not have any SDH factors identified. Factors identified per patient ranged from 1 to 12 with an average of approximately 2 factors per encounter with a total of 1584 factors identified. Out of the 1584 identified factors, 493 had associated counseling and intervention strategies, 108 included diagnosis codes, and 20 included billing codes. Educational limitations, language barriers, and family care demands were the most identified factors. This study also examines the amount of services provided for each SDH, as well as which SDH were provided with diagnostic and/or billing codes. Lastly, the authors examine differences in the card study between \ health centers in each state. Although providers understand the importance of SDH, they were not able to provide resources or associate codes for treating SDH. This study articulates the need for an increased focus on preparing medical students to identify and address SDH in practice, which may include educating students how to include SDH in the electronic health record.

**Lomis K, Amiel JM, Ryan MS, et al. Implementing an entrustable professional activities framework in undergraduate medical education: Early lessons from the AAMC Core Entrustable Professional Activities for Entering Residency Pilot. *Acad Med*. 2017;92:765-770.**

This article presents the structure and preliminary results of the core entrustable professional activities (EPA) pilot group to guide institutions planning to implement the core EPA framework. These pilot schools are designing and implementing educational systems that use the core EPA framework to develop tools for assessing student's readiness to perform the core EPAs. They are also sharing lessons learned facilitating adaptation of the core EPA framework at other medical schools. The early work of this group focused on defining

a vision and shared mental model of the EPA framework. After a review of the core EPA framework, several schools were assigned to each EPA. Each school will implement the core EPA framework as it best fits with their curriculum and will follow guiding principles, but implementation will differ between schools. As such, understanding how to best assess and report the core EPAs will be an iterative process. In addition to focusing on each EPA, teams are also focusing on formal entrustment, assessment, curriculum development, and faculty development. These groups have developed two manuals, one for curriculum developers mapping the core EPAs to domains of competence, and the other for faculty and learners describing the core EPA framework. The group has been focusing on developing additional frameworks in the aforementioned topic areas to assist other schools in implementing the core EPAs. Further work is needed to develop or identify multiple assessments necessary to facilitate summative entrustment decisions in the context of each school's curriculum. A systematic approach should include faculty development to facilitate coaching and feedback for student improvement. Entrustment decisions need to be standardized across schools to facilitate the educational handover from medical school to residency. Until this work is standardized, it should not be used formally across institutions; future work will include a learning community of educators external to the current pilot group. Efforts of the core EPA pilot schools will help inform the health professions education community on making entrustment decisions, which will eventually help facilitate learners' transitions. This pilot group also provides an example of a multi-institutional collaborative approach to developing consensus on complex concepts in medical education.

**Lomis KD, Russell RG, Davidson MA, et al. Competency milestones for medical students: Design, implementation and analysis at one medical school. *Med Teach*. 2017;39:494-504.**

This article outlines a continuous informed self-assessment process utilizing competency milestones at the Vanderbilt University School of Medicine. In this process, learners and coaches work together to understand gaps in learning and areas in which each learner needs to improve. A committee identifies behaviors that should be assessed over time. Identification of these behaviors is based on faculty perceptions of importance; priorities based on various different existing assessments; content on which students have struggled with in the past; areas that are assessable in the first year. Consensus on priority areas was developed through a modified Delphi process, and milestone writing guidelines were provided to workgroups based on specific content areas. Assessments were recorded in electronic portfolios, with a customized assessment developed for each course. Only competencies relevant to the specific course were used, but course directors were not allowed to change any of the language. Students were trained on using the competencies for peer review. Using a standardized set of competencies and milestones across courses provided multiple points of assessment. The milestones were validated using an iterative approach focusing on content, variation in rater scores, and feedback on the pragmatic use of the milestones. Results of the analysis showed that the milestones discerned developmental differences amongst students, and the same students do not receive similar milestone scores across competencies. Generally, ratings amongst faculty and peers vary, and most did not have consistently high or low scores. Student and faculty perceptions of the milestones were mixed. Some found the process to be a burden, while others thought it was a useful way to give and receive feedback. Although some students were not sure how to use the feedback received, this may have been related to characteristics of the portfolio coach, student, or their interaction. Lastly, milestones were revised based on feedback received through focus groups and standing meetings. This article may provide guidance for health professions education programs interested in implementing a milestone-based assessment system at their institution.

**McCoy L, Lewis JH, Benett T, Allgood JA, Bay C, Schwartz FN. Fostering service orientation in medical students through a virtual community health center. *J Fam Med Community Health*. 2016;3:1078-1085.**

This article describes a pilot of a virtual community health center with a focus on improving clinical reasoning, student engagement, collaboration, and understanding of primary care issues. In the first semester of their first year, student teams met with eight virtual families and worked through clinical case activities, which included history-taking, testing, diagnosing, obtaining interprofessional consultations, and suggesting a treatment plan. This study incorporated pre-post quizzes, virtual patient simulation case-learning analytics, feedback, and case debrief notes. The exercises gave students an opportunity to improve their clinical skills with feedback, make team-based decisions, and discuss patient care. The study affirmed that students were engaged. Feedback from evaluation data were used to improve learning activities. This article describes how virtual families may be integrated in health professions curricula to teach students how to function in community-based health care systems.

**McCoy, Lewis JH, Dalton D. Gamification and multimedia for medical education: A landscape review. *J Am Osteopath Assoc*. 2016;116:22-34.**

This article describes a review of gaming resources utilized in medical education and summarizes educational advantages and existing games, applications, and simulations. Gaming resources reviewed are ones that are available commercially or developed, piloted, and disseminated by medical educators. The authors describe the advantages of gamification and multimedia in medical education as they relate to learning outcomes, engagement, analytics, collaboration, practical application, clinical decision making, distance learning, and feedback. This review of gamification resources provides health professions education programs with examples of how gamification may be integrated with curricula.

**McCoy, Pettit RK, Lewis JH, Allgood JA, Bay C, Schwartz FN. Evaluating medical student engagement during virtual patient simulations: A sequential, mixed methods study. *BMC Med Educ*. 2016;16:1-15.**

This article is a study of student engagement with clinical case practice using virtual patient simulation. In this study, engagement is measured as flow, relevance, and interest. Virtual patient simulation cases were developed to expose student teams to managing a patient encounter and formulating a general diagnosis. Evaluation measures included observation forms and analysis memos, classroom photographs, feedback forms, and exit surveys. The findings of this study suggest this activity fostered flow as evidenced by students' focus on the activity, but, while students were engaged, they did experience elements of cognitive overload. These activities are relevant to student goals of clinical case practice, exam preparation, and receiving feedback. This article informs the health professions education community's understanding of practical facilitators and barriers in utilizing virtual patient simulation.

**Mello MJ, Feller E, George P, Borkan J. Advancing the integration of population medicine into medical curricula at The Warren Alpert Medical School of Brown University: A new master's degree program. *R I Med J*. 2015;98:22-26.**

This article describes a nine-course curriculum used at one medical school for students pursuing a Master of Science in Population Medicine in addition to a medical degree. This program incorporates

continuous threads of built-in goals for the completion of a thesis as well as accompanying coursework. The thesis projects are designed to be completed over the course of the four-year medical school curriculum. This program mitigates barriers to medical students conducting research by teaching research methodology, building in a required independent study course, providing mentorship along with library and statistical support, and including scientific writing sessions within the curriculum. This article gives an example of how medical education programs may implement adaptable curricula focused on a diverse range of health systems science topics including, health disparities, leadership, biostatistics, and the relationship between clinical and population medicine.

**Morgan H, Skinner B, Marzano D, Fitzgerald J, Curran D, Hammoud M. Improving the medical school-residency transition. *Clin Teach*. 2016;13:1-4.**

This article examines a four-week obstetrics and gynecology residency preparation course. On the first and last day of the elective, all 13 students completed the Association of Professors of Gynecology and Obstetrics (APGO) knowledge assessment. Students retook the exam before starting their residency. The exam is designed to assess incoming intern knowledge based on the Accreditation Council for Graduate Medical Education Medical Knowledge and Patient Care level-1 milestones. The authors found that there was a statistically significant improvement from the pre-test mean to the post-test mean. Moreover, the authors reported that eight of the nine students who completed the APGO knowledge assessment immediately prior to the start of residency passed the exam. This article provides an example of how medical schools can improve the transition to residency by implementing and evaluating residency preparation courses.

**Parent K, Jones K, Phillips L, Stojan JN, House JB. Teaching patient- and family-centered care: Integrating shared humanity into medical education curricula. *Am Med Assoc J Ethics*. 2016;18:24-32.**

This article discusses the implementation of patient- and family-centered care (PFCC) into two courses in the University of Michigan's new medical school curriculum. The authors and their volunteer patient-family advisers developed and implemented coursework for medical students that emphasize PFCC principles in classroom and home settings. PFCC was incorporated into two courses: "Doctoring: Caring for Patients, Families and Communities," a longitudinal course that includes patient-student partnerships and home visits to lay the foundation for thoughtful and skilled clinical practice, and "Initial Clinical Experience," a longitudinal clinical experience course organized around three aspects of health care: patients, teams and systems. The goal in each of these courses is to improve communication skills for both patients and the health care team, thereby improving the care of the patients within the health care system and recognizing the value of partnering with patients and family members. This article informs medical education programs interested in integrating PFCC concepts into their medical school curriculum.

**Paul T. "Nothing about us without us": Toward patient- and family-centered care. *Am Med Assoc J Ethics*. 2016;18:3-5.**

This article aims to define and contextualize patient- and family-centered care (PFCC). PFCC is built upon four fundamental principles: treating patients and families with respect and dignity, sharing information, encouraging patient and family participation in care and decision making, and fostering collaboration in care delivery and program design, implementation, and evaluation. PFCC is about including patients and families in all aspects of health care. As part of a broader movement toward participatory medicine that advocates for collaborative partnerships in health care, PFCC means developing partnerships with patients and their families. It involves recognizing their expertise by involving them as members of clinical care teams, advisory committees, and regulatory research boards; and promoting inclusion of patients and their loved ones in bedside and systems-level health care dialogues. This article informs the efforts of health professions education programs that are incorporating the patient and family perspective into their curricula.

**Pettepher CC, Lomis KD, Osheroff N. From theory to practice: Utilizing competency-based milestones to assess professional growth and development in the foundational science blocks of a pre-clerkship medical school curriculum. *Med Sci Educ*. 2016;26:491-497.**

This article describes one medical school's approach to developing competency-based milestones for assessing foundational medical knowledge in the early stage of medical school. Milestones were mapped to 18 competencies, and students were assessed using an electronic form with six anchors within each competency describing specific behaviors. This curriculum was taught using a student-run, case-based format similar to problem-based learning, in which students rotated between groups and interacted with new students at each rotation. Facilitators and students were trained in milestone-based assessment and were given opportunities to provide feedback on the process. A process of peer-assessment was included. The milestone-based assessments were integrated with quantitative assessments (e.g., quizzes, essays) to make passing decisions, and students needed to receive adequate scores in all domains to pass (i.e., excellent performance in three domains and deficiency in one domain did not warrant a passing grade). This article extends the health professions education literature on competency-based education and provides an example of implementation at one medical school.

**Pinelli V, Stuckey HL, Gonzalo JD. Exploring challenges in the patient's discharge process form the internal medicine service: A qualitative study of patients' and providers' perceptions. [published online ahead of print on July 7, 2017]. *J Interprof Care*. doi: 10.1080/13561820.2017.1322562.**

This study explores barriers of the discharge process from the viewpoint of providers and patients. The authors employed a phenomenological approach interviewing 39 providers and seven patients, as well as conducting follow-up focus groups with an additional 41 providers to further understand particular areas recommended for improvement. Providers included any member of the interprofessional team involved in the discharge process. The researchers used an inductive approach in analyzing the data, which yielded five primary categories of barriers: systems insufficiencies; lack of understanding interprofessional provider roles; poor communication; patient-perspective issues; and a poor collaborative process. Systems issues were the most common barrier and included barriers without immediate solutions. A poor understanding of provider roles included both a lack of understanding of interprofessional roles and a misunderstanding of one's own role. In general, information communication, specifically discharge instructions were not efficient and written to the patient's level of understanding. Patient issues were specific to individual patients and included factors that may lead to adverse events. Lastly, one main contributor to poor collaboration was the absence of any team member on rounds. The patients' main issues were related to the perceived lack of communication between providers at the time of discharge. Additionally, the authors synthesized suggested strategies for improving the care transitions based on communication, collaboration, systems factors, and patient factors. The practice issues articulated in this article

highlight the need for medical students to be further exposed to systems practices and taught health systems science concepts.

**Rappaport L, Coleman N, Dumenco L, Tobin-Tyler E, Dollase RH, George P. Future health disparity initiatives at the Warren Alpert Medical School of Brown University. *R I Med J*. 2014;97:36-39.**

This article highlights the need for medical schools to teach students about health disparities and social determinants of health in an evolving health care system. Additionally, it describe one medical school's plans to deliberately include these topics in the curriculum, in addition currently teaching them to first- and third-year students within existing integrated curriculum and clerkships. Future curriculum development efforts at this institution will include a master's degree program in primary care and population medicine, which will utilize the longitudinal integrated clerkship model and include additional courses focusing on the intersection of clinical medicine, population health, and health care policy, as well as opportunities to address these issues through scholarly projects. Lastly, students initiated a symposium to focus on health disparities issues and receive feedback from local stakeholders regarding key content areas that have yet to be addressed. This article provides a solution for further integrating health disparities and social determinants of health content within the medical school curriculum.

**Santen SA, Seidelman JL, Miller CS, et al. Milestones for internal medicine sub-interns. *Am J Med*. 2015;128;7:790-798.**

This article defines milestones for fourth-year medical students in an internal medicine sub-internship to obtain a better understanding of tasks that medical students can perform with indirect supervision. Surveys for medical students and attending physicians were created based on a literature review and perceptions of faculty and students. The surveys contain the same content but are modified to fit their positions. The surveys were piloted, and validity evidence for content, response process, and internal structure was collected. A majority of faculty reported that behaviors they would sometimes or never supervise medical students on are reflected in a "reporter" level category and include the history and physical as well as data collection. Other behaviors that the majority of faculty reported they would always supervise medical students on are in the category of "interpreter" level and include significant physical examination findings and test results. Although there were many discrepancies between faculty and students in their perceptions of the level of supervision required for specific behaviors, faculty also noted that their level of trust is based on knowing the student. The results of this study complement national efforts in developing competency-based education programs for medical schools and residencies, and the methodology used in this article may inform medical education programs in identifying the level of entrustment placed upon students participating in systems-based activities.

**Shenson JA, Adams RC, Ahmed ST, Spickard A. Formation of a new entity to support effective use of technology in medical education: The student technology committee. *JMIR Med Educ*. 2015;1:e9.**

This article presents the findings of a medical student-led and faculty-supported technology committee developed at Vanderbilt University School of Medicine to harness valuable input from students in a comprehensive fashion. A committee was established with cooperation of school administration, a faculty adviser with experience launching educational technologies, and a group of students passionate about this domain. The committee serves four key functions: acting as liaisons between students and administration; advising the development of institutional educational technologies; developing, piloting, and assessing new student-led educational technologies; and promoting biomedical and educational informatics within the school community. The committee's success hinges on member composition, school leadership buy-in, active involvement in institutional activities, and support for committee initiatives. At the conclusion of this committee's implementations students have integral roles in advancing medical education technology to improve training for 21st-century physicians. This student technology committee model provides framework for this integration, can be readily implemented at other institutions, and creates immediate value for students, faculty, information technology staff, and the school community.

**Skochelak S, Swee D, Elliott V. Building the medical school of the future: Working with the AMA Accelerating Change in Medical Education initiative. *MD Advis*. 2016;9:4-6.**

This article summarizes the need for change within medical education and the current work of the American Medical Association Accelerating Change in Medical Education Consortium. Mainly, medical education has not kept up with changes in the health care system. This article describes aspects of the grant projects of the first cohort of the consortium and gives an example of how the projects of the consortium's second cohort complement and enhance this work. In addition, the authors give examples of how the consortium has interacted with the broader medical education community through conferences and publications.

**Skochelak SE, Stack SJ. Creating the medical schools of the future. *Acad Med*. 2017;92:16-19.**

This article discusses the need for change within medical education. The gap continues to widen between how physicians are trained and the future needs of our health care system. The American Medical Association (AMA) is working to support innovative models through partnerships with medical schools, educators, professional organizations, and accreditors to create the medical school of the future. In 2013, the AMA designed an initiative to support rapid innovation among medical schools and disseminate the ideas being tested to additional medical schools. Awards of $1 million were made to medical schools to redesign curricula for flexible, individualized learning pathways, measure achievement of competencies, develop new assessment tools to test readiness for residency, and implement new models for clinical experiences within health care systems. Most of the schools have embarked on major curriculum revisions, replacing as much as 25% of the curriculum with new content in health systems science in all four years of training. In 2015, the AMA invited 21 additional schools to join the 11 founding schools in testing and disseminating innovations through the consortium and beyond. This article gives an overview of the American Medical Association Accelerating Change in Medical Education Consortium and the overall goals.

**Sozener CB, Lypson ML, House JB, et al. Reporting achievement of medical student milestones to residency program directors: An educational handover. *Acad Med*. 2016;91:676-684.**

This article describes the use of a post-Match milestone-based medical student performance evaluation for assessing the competency of medical students entering emergency medicine residency programs to assist in the educational handover process. An ad hoc Emergency Medicine Medical Student Milestone Competency Committee was formed with the goals of developing such a performance evaluation, providing program directors with the results of these evaluations, and receiving feedback on the evaluation from program directors. This process was completed for seven students entering emergency medicine residencies at six distinct institutions, none of which were the same institution as their medical school. Performance data in

this evaluation included an emergency medicine clerkship assessment, the Comprehensive Clinical Exam, an emergency medicine boot camp elective, and other sources including USMLE scores. The committee mapped assessments to the emergency medicine milestones before generating evaluation results for each student, and each student reviewed their program director letters with no suggestions for revisions. Three milestones related to ultrasound utilization, observation/reassessment, and patient safety could not be assessed, and all students met level 1 or level 2 milestones. Out of five program directors who replied, all thought the evaluation provided information not traditionally available and could be useful for all residents. This article provides an example of how the medical school to residency continuum could be improved by providing program directors with additional assessment information regarding incoming interns.

**Spickard A, Ahmed T, Lomis K, Johnson K, Miller B. Changing medical school IT to support medical education transformation. *Teach Learn Med*. 2016:28;80-87.**

This article describes the design and implementation of a learning management system (LMS) at one medical school implementing major curricular changes. After testing different methods, the medical school created a new educational portfolio platform by adapting existing open source software to their local systems. This new product filled a gap in their new curriculum and existing systems by creating a product that supports active learning, longitudinal experiences, and competency-based assessment. Faculty and students use a single sign-on to access features of the portfolio that allow for the instruction of new educational pedagogies, communication and file sharing between all students and faculty, and the ability to support individual learning plans. In addition, learning plans allow coaches to track student's goals and receive alerts if learners are not on track. Success of the LMS has led to its adoption by some residencies at the same institution. This article provides an example of how educational IT can be used to complement the implementation of a new curriculum focused on active- and team-based learning and integrated workplace-based experiences, as well as progression through a competency-based curriculum.

**Starr SR, Reed DA, Essary A, et al. Science of health care delivery as a first step to advance undergraduate medical education: A multi-institutional collaboration. *Healthc* (Amst).2017;5:98-104.**

The article identifies a framework for the science of health care delivery (SHCD) through the collaboration of six institutions. The authors present various approaches to the SHCD curriculum from different medical schools. Shared challenges among the universities in implementing SHCD curricula in undergraduate medical education include student engagement, faculty development, and curricular integration. To alleviate such challenges, first schools need clear and identifiable learning outcomes. Second, schools need to provide faculty development surrounding SHCD. Third, students need valid and authentic assessments. Lastly, a clear value must be established to align SHCD curriculum with clinical practice. This article informs medical education programs of different approaches to implementing SHCD curricula, as well as associated barriers and facilitators of implementing this curriculum.

**Starr SR, Agrwal N, Bryan MJ. Science of health care delivery: An innovation in undergraduate medical education to meet society's needs. [published online ahead of print on Aug. 2, 2017]. *Mayo Clin Proc Inn Qual Out*. doi: 10.1016/j.mayocpiqo.2017.07.001.**

This article outlines Mayo Clinic School of Medicine's Science of Health Care Delivery (SHCD) curriculum. Six domains of knowledge are included in the framework including person-centered care; population-centered care; team-based care; high-value care; health care policy, economics, and technology; and leadership. The educational methods used in the curriculum include blended learning, simulation, and longitudinal curricular threads. The authors describe aspects of their student assessment and program evaluation which include standardized cases, a health systems science examination, and surveys capturing perceptions of SHCD topics. All students who matriculate on or after 2015 earn the Certificate of Science in Health Care Delivery. Student perceptions about the program were identified as a challenge in implementing this new curriculum, primarily in regards to the curriculum having an inconsistent focus with their expectations. The authors suggest more transparency of the importance of a SHCD curriculum at the time of medical school interviews, as well as greater emphasis by residencies regarding the importance of a SHCD education. Second, faculty development is presented as a challenge in implementing the SHCD curriculum insofar as the faculty gained minimal to no formal education surrounding SHCD knowledge. These challenges are ongoing and continue to be addressed based on needs, gaps, and student feedback. This article presents an example of how a health care delivery curriculum framework may be integrated within a medical school curriculum to fit the needs of other medical education programs.

**Thayer EK, Rathkey D, Miller MF, et al. Applying the institutional review board data repository approach to manage ethical considerations in evaluating and studying medical education. *Med Educ Online*. 2016;21:10.3402/meo.v21.32021.**

This article reviews institutional review board issues with regard to valuation and research in medical education and two schools' application of a data repository approach to mitigate these issues. This approach is specifically helpful for institutions implementing and evaluating curricular innovations. One school included medical students, residents, and fellows in their data repository, and data are only included if it is a standard part of the educational experience, collected for all trainees, and if the trainee has actively consented to allow for identified data to be used in the registry. With an 86% consent rate for medical students and 71% for residents, there are 2066 individuals in the registry, 183 of which have data from both medical school and residency. Another medical school uses a similar repository to collect medical student data and uses this to facilitate feedback for students within an individualized curriculum, as well as including data within observational studies to improve curricular approaches. In preparing a repository application, it is important to identify primary data collection periods, specific plans for how the data will be used longitudinally, and how the data will be retrieved for analytic purposes. For example, schools may deliberately request sharing data with other institutions for joint research opportunities. This article informs health professions education programs in describing how they may create a data repository for collecting, analyzing, and sharing data for the purpose of educational research.

**Tsai J, Ucik L, Baldwin N, Hasslinger C, George P. Race matters? Examining and rethinking race portrayal in preclinical medical education. *Acad Med*. 2016;91:916-920.**

This article discusses race portrayal in preclinical medical education. The article focuses on a sampling of lecture slides at the authors' medical school over a three to five month time frame that demonstrated that race was almost always presented as a biological risk factor. This presentation of race as an essential component of epidemiology, risk, diagnosis, and treatment without social context is problematic as a broad body of literature supports that race is not a robust biological category. The authors opine that current preclinical medical curricula inaccurately teach race as a definitive medical cat-

egory without context, which may perpetuate misunderstandings of race as a bio-scientific datum, increase bias among student-doctors, and ultimately contribute to worse patient outcomes. The survey led to the implementation of changes in curriculum for first and second-year orientation, doctoring, and preclinical courses as part of the creation of a longitudinal curriculum on race in medicine. This article informs other medical schools interested in making changes to adequately contextualize race in their curriculum.

**Tunkel AR. Health disparities education – the time is now. *R I Med J*. 2014;97:21.**

This article stresses the need for health disparities education despite a lack of consensus on the definition of health care disparities. As long as there are inequities in health outcomes, students need to be taught about the social determinants of health in settings that affect outcomes. In addition, the author introduces a special issue of this journal highlighting innovations at one medical school that address these issues. This article describes the need for education addressing health care disparities and the social determinants of health.

**Wagenshutz H, McKean E, Zurales K, Santen S. Facilitating guided reflections on leadership activities. *Med Educ*. 2016;50:1149-1150.**

This article presents an instructional strategy from the University of Michigan on implementing Borton's framework (What? So what? Now what?) to broaden recognition about concepts of leadership among first year University of Michigan medical students. The authors describe the process of leadership learning opportunities, including leadership reflection throughout medical students' first year. In these reflections, the authors implement Borton's framework and students identify the task, articulate the significance, and synthesize their goal setting. The authors found that the model facilitated objective assessment of students' reflections. Furthermore, the authors promote further instruction in Borton's framework to help students further develop effective leadership skills. This article describes an instructional approach that may be integrated within other health professions education programs to provide medical students with the tools to recognize various leadership opportunities.

**White J, Riese A, Clyne B, Vanvleet MW, George P. Integrating population and clinical medicine: A new third-year curriculum to prepare medical students for the care of individuals, panels, and populations. *R I Med J*. 2015;98:32-35.**

This article describes a Primary Care-Population Medicine program at one medical school aimed at filling curricular gaps addressing the integration of population and clinical medicine. A course teaching this content will include small group sessions and case-based sessions which follow a family's interaction with the health care system. The course will also include longitudinal threads of the social and community context, quality improvement, and leadership which include experiential learning opportunities. Learning in this course will be done in conjunction with medical training within a longitudinal integrated curriculum. This article gives medical school an example of how conceptual and experiential opportunities of teaching components of health systems science can be integrated within a curriculum.

**Welcher CM, Hersh W, Takesue B, Elliott VS, Hawkins RE. Barriers to medical students' electronic health record access can impede their preparedness for practice. [published online ahead of print on July 25, 2017]. *Acad Med*. doi: 10.1097/ACM.0000000000001829.**

This article describes the current limitations surrounding medical student access to electronic health records (EHRs). While there is widespread access to EHRs by universities, student access remains inconsistent. The implications of such access includes students lacking skills including patient charting and accessing lab results. Second, first-year residents then end up spending too much time familiarizing themselves with EHRs, shifting some focus away from patient care. Some medical schools have allowed students access to EHR simulations and electronic templates; however, these tools do not provide necessary skills in data management. The authors attribute limitations of student access to EHRs to strict interpretations of current HIPAA laws, even though patient care team members are allowed access—including medical students. Secondly, because there are various EHRs, a medical student's familiarity with one system does not mean fluency for all EHR systems. The authors further discuss policy proposals for implementing greater medical student access to EHRs. These proposals include assigning medical students unique usernames and passwords, along with supervisor sign off and feedback to all medical student EHR notes. Lastly, the authors provide innovative models of EHR access by identifying best practices from United States medical schools who have allow students access to EHRs as a teaching tool. Additional solutions to these issues include the growing interoperability of systems improving student adaptability to various EHR systems, as well as a more robust medical education training. The authors advocate for more consistent and thorough student access to EHRs as a method for better preparing medical students for residency and practice, and provides examples of how health professions education programs may integrate EHRs within their curricula.

**Wiest K, Farnan J, Byrne E, et al. Use of simulation to assess incoming interns' recognition of opportunities for Choose Wisely. *J Hosp Med*. 2017;12:493-497.**

This article describes a study assessing postgraduate year one (PGY1) interns' identification of Choosing Wisely™ low-value care recommendations through participation in a simulation at the University of Chicago medical school. This particular simulation, "Room of Horrors," simulates an inpatient hospital room. There are eight identifiable safety hazards, and four additional low-value hazards. The 120 PGY1 interns in this study represented 60 medical schools and seven different specialties. Data collected in this study was comprised of free-response answers, which were manually coded. Furthermore, the use of descriptive statistics summarized mean percentages for each hazard. T-tests were also extensively used to compare various results, including low-value versus safety hazards. In part, the authors found that participants identified significantly fewer low-value hazards than safety hazards. Second, there was a statistically insignificant difference between interns in procedural-intensive versus non-procedural-intensive specialties in identifying low-value hazards. Third, interns identified significantly less chart-based errors than room-based errors. In the participants' follow up and feedback, they expressed an assumption that patient charts were correct. The authors' findings suggest PGY1 interns exhibit inadequate identification of low-value care, emphasizing the necessity of medical schools to focus efforts on low-value care training to better prepare students for residency. Medical schools may integrate this simulation into their assessment of students and program evaluation to identify gaps in patient safety education within their curricula.

**Williams BC, Mullan PB, Haig AJ, et al. Developing a professional pathway in health equity to facilitate curricular transformation at the University of Michigan Medical School. *Acad Med*. 2014;89:1153-1156.**

This article describes the development, implementation, and evaluation of an optional Global Health and Disparities Path of Excellence

curriculum. The goals of this pathway were to deliberately address the school's social mission, develop and evaluate methods of teaching this content that can be adapted throughout broader medical education curriculum, and provide guidance in developing similar pathways related to different content areas. Students and faculty worked together to identify curricular content and instructional methods, metrics for assessing progress, and criteria for completion. Participation in the program included completion of a scholarly project, small-group activities and seminars, and longitudinal advising. Students' progress through the track was monitored with an electronic portfolio and included narrative feedback from the student, adviser, and others with whom the student worked. Twenty-nine students completed scholarly projects and included content from clinical interventions to program evaluation. This pathway was reviewed positively by students and faculty. Awareness of the school's social mission increased, and the school modified parts of the overall curriculum to include health disparities content open to all students. Additionally, students have initiated activities to increase the focus on these issues. This article gives medical schools an example of how to integrate and develop a program focused on teaching health disparities.

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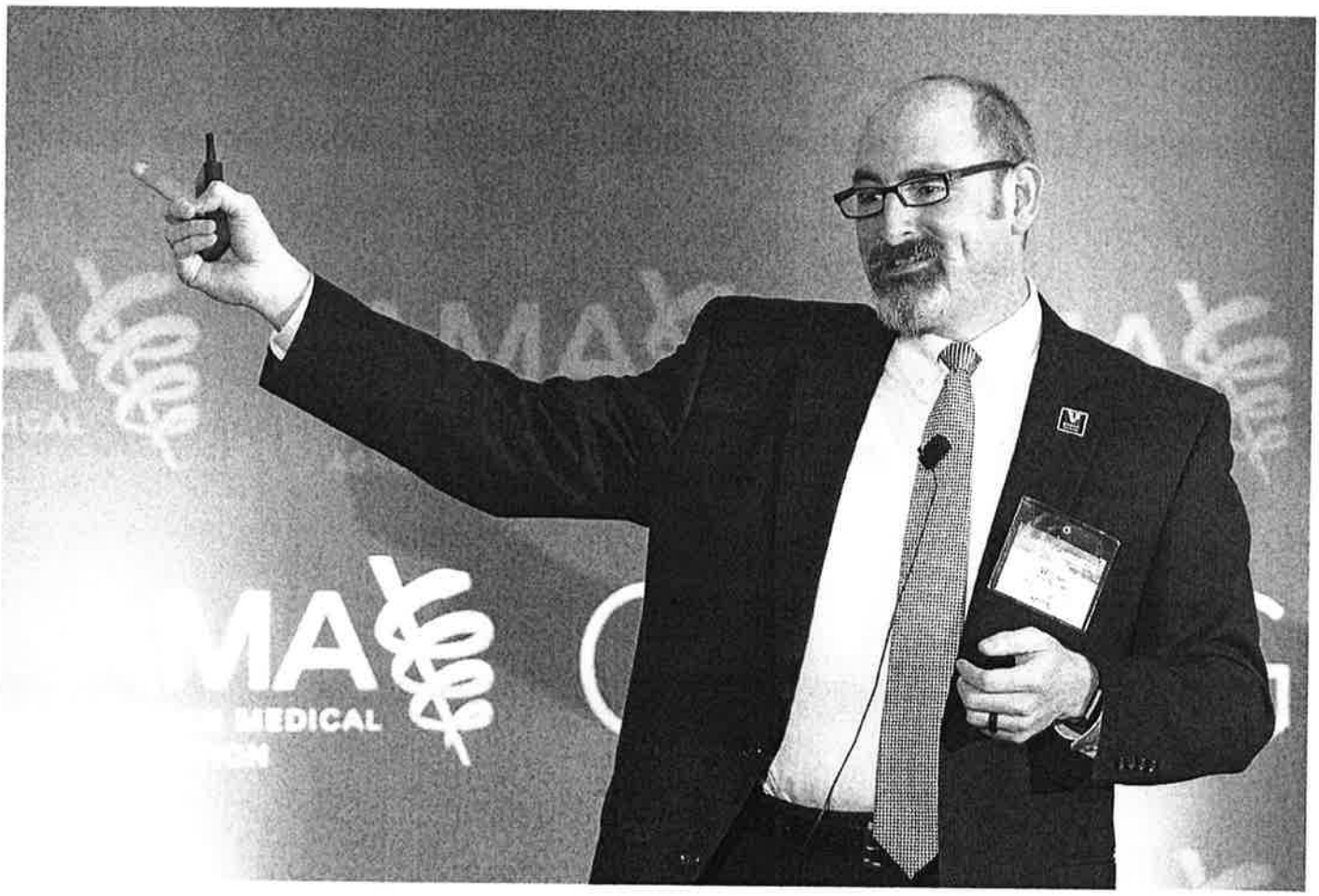
ACCELERATING CHANGE IN MEDICAL EDUCATION

# 4 phases to making goal of lifelong physician learner a reality

**OCTOBER 20, 2017**

**Brendan Murphy**
News Writer
American Medical Association
Full Bio



Too many practicing physicians take lessons learned during their training years and apply them, without significant deviation, throughout their decades-long careers in

medicine. When that happens, both patients and physicians are worse off.

"We want physician lifelong learners, but we struggle with the practical implementation of what that actually looks like," said William B. Cutrer, MD, an assistant dean for undergraduate medical education at Vanderbilt University School of Medicine. "While we like the idea of lifelong learning, always continuing to improve and staying current with the literature, as a group, a lot of practicing physicians don't always accomplish that goal."

With that problem in mind, Dr. Cutrer and faculty members from several schools within the AMA's Accelerating Change in Medical Education Consortium have developed a conceptual model that aims to provide medical students the skills and habits they need to constantly improve their skills through retirement. It is their belief that providing the tools that foster adaptive expertise as a skill set among medical students will create a generation of physicians equipped to handle the rapidly changing health care landscape.

Dr. Cutrer presented his ideas about the importance of this concept, known as the master adaptive learner, during a pair of recent AMA conferences—the AMA Change**MedEd**™ 2017 National Conference in Chicago and a meeting focusing on "The Role of Adaptive Expertise in Health Systems Science" in New York.

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## Learning how to find new solutions

In mapping out a method to create medical students with the desired adaptive skill set, physicians first had to define what medical students are and what this model hopes they become.

Typically, medical students work toward and demonstrate early routine expertise. In essence, this is the ability to do the same tasks repeatedly, more efficiently and effectively. Routine expertise allows physicians to remember solutions to prior problems and apply them to new patients.

Routine expertise, however, falls short when a problem arises that differs from others a physician has encountered. That's when a physician needs to use adaptive

expertise by taking what they already now and incorporating new learnings to find new solutions.

"The skill set we are trying to target with this initiative is training medical students with the right habits to apply routine expertise when appropriate and adaptive expertise when appropriate," Dr. Cutrer said.

## The 4 phases of adaptive learning

The model through which Dr. Cutrer hopes to educate students to become master adaptive learners includes four phases. Breaking it down this way creates a system in which a learner, perhaps with the assistance of a coach or mentor, can determine where she is falling short.

The phases break down as follows:

- **Planning:** The learner identifies a knowledge gap without which she would not be able to begin learning solutions.
- **Learning:** The learner must first appraise the resources she found—are they the right solutions to the problem?—then go about digesting the information so it sticks.
- **Assessing:** A combination of self-assessment and external feedback in which the learner determines if her findings would require her to change her practice.
- **Adjusting:** The learner applies any necessary changes to her practice while determining the scope and scale at which they should be implemented.

## Moving beyond textbooks

The master adaptive learner differs from nearly every other aspect of medical education, Dr. Cutrer argues. Rather than teaching facts or concepts, this model is one that teaches learners how to learn. But as with much of the medical school curriculum, Dr. Cutrer believes the model is honed through experience.

"We really want people in the workplace learning from patient encounters, learning from actual scenarios ... starting to build their bank of expectations for what is the normal progression of different diseases. Textbooks are important, especially early on, but we have to move past that. We have to move to a deeper understanding and ability to use the knowledge as opposed to being able to regurgitate it for a test."

To expose students to these concepts, programs are trying a wide array of tangible methods, including exposing students to data that highlight how practicing

physicians struggle to adapt following their residency training.

While the methods of reinforcing the techniques that turn a medical student into a master adaptive learner are still a work in progress, it is Dr. Cutrer's belief that the concept has never been more necessary.

"Health care is changing dramatically compared to where it was even 10 or 15 years ago, as far as the complexity and all of the different things that weigh into taking care of an individual patient," he said. "So the physician of tomorrow, the physician of five or 10 years from now, is really going to need a different skill set of problem solving."

The presentation about the master adaptive learner concept was among dozens that took place during the ChangeMedEd conference. The event showcased how the AMA, through its Accelerating Change in Medical Education initiative, is working to reimagine and shape the future of medical education.

## More on this

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Adaptive Learning

T

# nts are skipping class in droves — and making lectures increasingly

by Orly Nadell Farber

August 14, 2018

*Alex Hogan/STAT*

The future doctors of America cut class. Not to gossip in the bathroom or flirt behind the bleachers. They skip to learn — at twice the speed.

Some medical students follow along with class remotely, watching sped-up recordings of their professors at home, in their pajamas. Others rarely tune in. At one school, attendance is so bad that a Nobel laureate recently lectured to mostly empty seats.

Nationally, nearly one-quarter of second-year medical students reported[1] last year that they "almost never" attended class during their first two, preclinical years, a 5 percent increase from 2015.

The AWOL students highlight increasing dissatisfaction and anxiety that there's a mismatch between what they're taught in class during those years and what they're expected to know — or how they're tested — on national licensing exams. Despite paying nearly $60,000 a year[2] in tuition, medical students are turning to unsanctioned online resources to prepare for Step 1, the make-or-break test typically taken at the end of the preclinical years.

Related: [3]
NYU says it will cover tuition for all its medical students — both now and in the future. [3]

These self-guided med students are akin to a group of American tourists wandering through Tokyo without a map. Like a tour guide hired on the street, the online learning tools — including memory aids, videos, and online quizzes — can enhance the educational journey, or send the students down a dead end.

Lawrence Wang, a third-year M.D.-Ph.D. student at the University of California, San Diego, and the National Institutes of Health, said he relied heavily on these resources during his first two years of medical school.

"There were times that I didn't go to a single class, and then I'd get to the actual exam and it would be my first time seeing the professor," he said. "Especially, when Step was coming up, I pretty much completely focused on studying outside materials."



Wang isn't alone. According to 2017 data from the Association for American Medical Colleges, 1 in 4 preclinical students watches educational videos — like those on YouTube — on a daily basis. And

according to two video developers, tens of thousands of medical students subscribe to their products — one of which costs $250 for two years, the other $370 for one year.

Leaders in medical education have begun to scramble. Some medical schools, like Harvard, have done away with lectures for the most part. Instead of spending hours in an auditorium, Harvard students learn the course content at home and then apply the knowledge in mandatory small group sessions.

Other institutions, like Johns Hopkins, are moving in the same direction, but have yet to make a full switch. Hopkins cut down on lectures and boosted sessions that require active student participation. Preclinical lecture attendance hovers around 30 to 40 percent, according to Dr. Nancy Hueppchen, associate dean for curriculum.

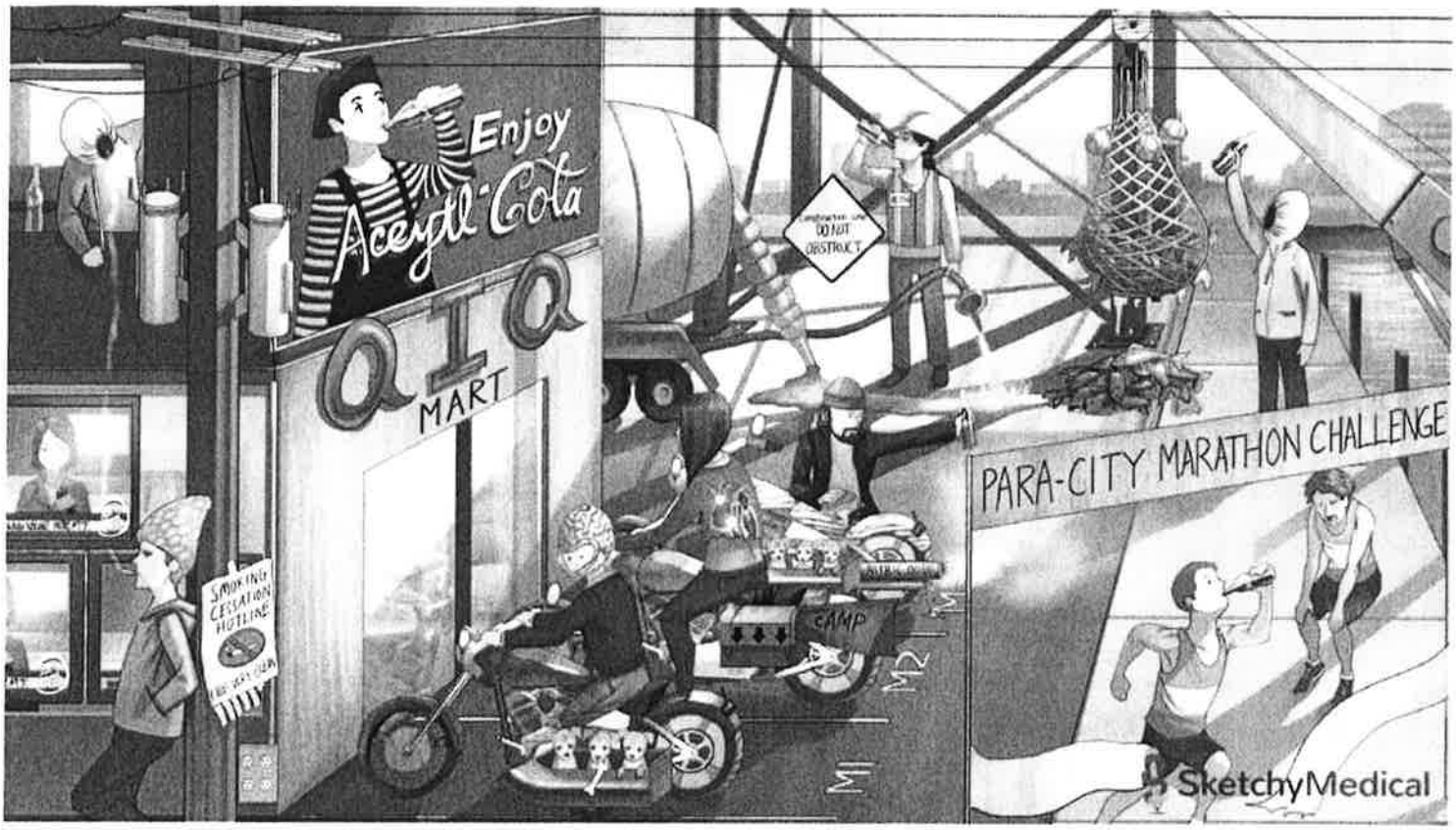
For many students, she said, licensing exam prep begins on day one of medical school: "They have this parallel curriculum going along with what we're teaching them."

Step 1, an eight-hour multiple choice test, is a big deal. Performance on the exam, though it's taken before most students even begin training in a hospital, heavily influences which medical specialties they can eventually pursue after school and at what hospitals they can pursue them.

With medical schools grading pass-fail, the Step 1 score is an increasingly significant piece of information that's used to sort through residency applications, Hueppchen said. When she took the exam, it was only used as a pass-fail test. Today, residency programs rely on the score more heavily; students and faculty suspect that it's used as a cutoff for making admissions decisions.

Ryan Carlson, a third-year M.D.-Ph.D. student at the University of Washington, said that his school focused on teaching "what they thought was important for a physician to know." But medical students have to know more than what is relevant to a practicing clinician to succeed on Step. The exam focuses on rare diseases and other minutiae, said Carlson, who now tutors for the test.

Hueppchen acknowledged that students at Hopkins and elsewhere "express some distrust that they're getting everything they need — or that we're being meticulous in pointing out what they need — to study for and excel on the Step 1 exam."




SketchyMedical produces visual memory aids with elaborate illustrations, like this one of the major drugs targeting the sympathetic nervous system. *Stephen Wang at SketchyMedical*

## The medical tour guides

That distrust has spawned a cottage industry of online study aids. Most are a far cry from your high school SAT prep course.

SketchyMedical[5] is one of the most popular guides. The company, built in 2013 by three then-medical students at the University of California, Irvine, produces visual memory aids with elaborate illustrations to help students learn and retain the voluminous material they're expected to know.

Dr. Andrew Berg and his co-founders, Drs. Saud Siddiqui and Bryan Lemieux, started sketching pictures and pairing them with stories while taking microbiology in their second year of medical school.

"We were just bombarded with different names of bacteria, viruses, and fungi, and we were having a tough time keeping them all straight," he said.

The sketches helped them, and now other students are using them, too.

Imagine it's test day and a med student is asked which drug she would use to treat a patient's postoperative gastrointestinal blockage. The student closes her eyes and mentally enters the world of "Acetyl-Cola," a bustling port town that's depicted in one of SketchyMedical's cartoons. Outside a storefront, the student finds construction workers, motorcyclists wearing brain-shaped helmets, piles of dripping-wet fish, and a man sporting an adrenal gland-shaped beanie.

A colon-shaped mixing truck pouring out cement is an unfortunate, but effective, symbol for defecation, and a worker wearing a name tag reading "Beth" and drinking a cola reminds the student of the drug

bethanechol, given to treat intestinal obstructions.

The illustrations are turned into narrated videos, which teach drug names and their mechanisms and side effects. SketchyMedical has also produced videos on microbiology and pathology.

Berg compares[8] the work of Sketchy to hieroglyphics in ancient Egypt. But for many, Sketchy evokes a different technique used a thousand years later in ancient Greece: method of loci, also called a memory palace or journey.

Memory palaces are typically imagined spaces in which a person can store information like a string of numbers or a series of words. Each piece of information is placed somewhere inside the palace. When the palace builder wants to recall an item, she can take a mental stroll through the space to retrieve it. This technique famously enabled Cicero, the Roman statesman and philosopher, to commit his speeches to memory.

"We accidentally stumbled upon these visual learning techniques, but now looking back we see there's a lot of evidence supporting visual learning," Berg said.

SketchyMedical is not the only extracurricular resource students rely on. An entire industry cropped up in the last few years, marketing videos and self-quizzing features to preclinical students. Dr. Jason Ryan, the creator of Boards and Beyond, is a name (and voice) familiar to medical students across the country.

Ryan, a faculty member at University of Connecticut School of Medicine, creates explanatory videos that track along with the content in First Aid, a Step preparatory book that Ryan said is more like "an encyclopedia of terms" than a real study aid. Ask any medical student if they use First Aid, and they'll point you to their heavily annotated, tattered copy.

While both Ryan and Berg consider their products supplements to regular medical education, many students view them as necessary investments for success. Choosing which ones to use can be a challenge, however.

"That was the biggest learning curve of med school — it wasn't so much how do I do well in it, it was, how do I use all these crazy resources that are being marketed to me to best meet my goal of passing Step," Carlson said.

## The old players react

This expanding corner of the medical education industry is both a product of a new attitude among students — born from anxiety surrounding exam prep — and a disrupter of the traditional classroom education. Med schools now have to think more creatively about how they train their future doctors, Berg said.

In 2015, Harvard Medical School revamped its curriculum for the first two years to enable clinical exposure and boost class attendance with a flipped-classroom model: Students learn the content at home, and then apply it during in-class exercises. Dr. Richard Schwartzstein, director of education scholarship,

said the program now emphasizes problem-solving and critical thinking — skills seen as essential to practicing medicine — instead of factual recall.

But while medical schools are de-emphasizing pure memorization, the national licensing exams have yet to reconsider, he acknowledged. Still, Schwartzstein is not a huge fan of external resources, citing their focus on memorization and pattern recognition as major weaknesses.

"You don't have to actually teach pattern recognition," he said. "We all are born with the capability of recognizing pattern." He advises students to stick to Harvard-developed videos and their recommended readings. Like many medical schools, Harvard gives students a dedicated study period — six to eight weeks without coursework — to "prepare in whatever way they deem most appropriate to take the boards," he said.

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In 'Drop Out Club,' desperate doctors counsel each other on quitting the field [9]

Hueppchen said that the outside resources "may have value in day-to-day studying, they may have value in studying for Step 1," but Hopkins has not vetted them so it doesn't recommend them to students either.

The National Board of Medical Examiners, which works with state medical boards to set the minimum standards for medical licensing and administers the Step exam, also doesn't endorse these products — or their use as hard lines for residency admissions, said Dr. Michael Barone, vice president of licensure programs. The group "is aware of some secondary uses of scores," he said, but the test's primary purpose is to report licensure alone.

So long as Step still requires intensive rote memorization, companies like SketchyMedical and Boards and Beyond will likely remain in business.

Both Berg and Ryan agree that physicians no longer need to memorize as much as they did in the past. Ryan's grandmother was one of the first female physicians to graduate from her medical school in the 1940s. Back then, he said, she had to remember everything. "If she had to go to a book every time she saw a patient, she'd never be able to work through the day."

Today, there's much more to know, and medicine is evolving so rapidly — with new drugs, guidelines, and practices — that physicians can't possibly remember it all. Instead, they look information up on their cellphones, using a variety of apps on the clinic floors. But preclinical students still need to commit board-tested material to memory, a task often compared to drinking from a firehose.

Needing to memorize for boards and learn in parallel for their institutions is the breeding ground for anxiety that Hueppchen said "has truly detracted from the joy of learning." It has even detracted from the joy of teaching, she added.

Berg said he tries to bring joy to memorization: "I think that what I hope to contribute the most is making studying more fun."

## Tags

## Links

1. https://www.aamc.org/download/488336/data/y2q2017report.pdf
2. https://www.aamc.org/data/tuitionandstudentfees/
3. https://www.statnews.com/2018/08/16/nyu-says-it-will-cover-tuition-for-all-its-medical-students-both-now-and-in-the-future/
4. https://www.statnews.com/stat-plus/
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