THE ABCs OF MEDICAL EDUCATION,
S.M.A.R.T. CLINICAL TEACHING, &
OU NEUROLOGY EDUCATION PROGRAMS

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Under Accreditation Council for Continuing Medical Education guidelines disclosure must be made regarding relevant financial relationships with commercial interests within the last 12 months.

David Lee Gordon, MD

I have no relevant financial relationships or affiliations with commercial interests to disclose.
THE ABCs OF MEDICAL EDUCATION & S.M.A.R.T. CLINICAL TEACHING

LEARNING OBJECTIVES

At the end of this Grand Rounds, the attendee will be able to:

- Define curriculum alignment and its role in competency-based & mastery learning
- Describe the implications of curriculum alignment in terms of course administration and implementation
- Describe the 10 essential features (ABCs) of medical education
- Describe the 5 components (S.M.A.R.T.) of effective clinical teaching
EFFECTIVE MEDICAL EDUCATION: SIMPLE CONCEPT, COMPLEX EXECUTION

The key to effective medical education is competency-based learning, based on the principle of curriculum alignment in which the learning objectives, assessments, and learning experiences are all aligned.

The principle is simple and logical.

Implementation is complex.

A word on nomenclature:

- competency-based learning = mastery learning;
- curriculum alignment = instructional alignment = blueprinting
BENJAMIN S. BLOOM (1913-1999)  
A G I A N T O F E D U C A T I O N A L R E F O R M

- American educational psychologist
- Facilitated initiation of Head Start program
- Played major role in founding the International Association for the Evaluation of Educational Achievement
- Beginning in the 1950s, responsible for furthering the concepts of:
  - Educational objective domains (Bloom’s taxonomy)
  - Instructional alignment
  - Mastery learning
COMPETENCY-BASED/MASTERY LEARNING: KEY EDUCATIONAL TERMS

- **Learning objectives** = pre-specified, learner-specific knowledge, skills, attitudes, & behaviors (KSAB)* that learners are expected to achieve

- **Competencies** (as used by ACGME) = educational program objectives (EPOs) = standardized categories of learning objectives = the categories of KSAB necessary to be a competent physician (ACGME & OUCOM have identified 6)

- **Assessment** = demonstration & evaluation of KSAB; proof that a learner has achieved an objective

- **Curriculum alignment** = instructional alignment = blueprinting = linking of objectives, assessments, and learning experiences to ensure learners achieve what is expected of them

*Modified from Bloom’s taxonomy of educational objectives into cognitive, psychomotor, & affective domains (Bloom et al. 1956)
COMPETENCY-BASED/MASTERY LEARNING: KEY EDUCATIONAL TERMS

- **Core content** = essential KSAB that learners must acquire prior to graduation & that are necessary for success after graduation
- **Entrustable professional activity (EPA)** = a learner-specific core clinical activity a learner should be able to perform independently; may be defined by a series of integrated learning objectives from multiple “competencies”
- **Milestones** = standardized learning objectives linked to a learner’s stage in development; objective-specific steps to “competency”
- **Hidden curriculum** = informal learning that differs from what is taught in the formal (declared) curriculum; may have a negative or positive influence on learners *(from Dent & Harden 2013)*
- **Learning environment** = the sum of internal (formal curriculum) & external (informal/hidden curriculum) circumstances & influences surrounding & affecting a person’s learning; in particular the modeling of professionalism & its influence on the learning & professionalism of trainees
COMPETENCY-BASED/MASTERY LEARNING: KEY PSYCHOLOGICAL TERMS

- **Flow** = flow “channel” = state of optimal experience = a state of enjoyment and maximal concentration that occurs as a result of participating in activities that one perceives as worth pursuing for their own sake, provide a sense of accomplishment, and lead to personal growth; activities that lead to “flow”:
  - Provide a sense that one’s skills are adequate to cope with the challenges at hand (i.e., learner’s skills match challenge difficulty)
  - Are part of a goal-directed, rule-bound action system that provides clear clues as to how well one is performing (i.e., include goals, structure, & feedback)  

  \[M \text{Csikszentmihalyi} 1990\]

- **Deliberate practice** = Focused, repetitive practice in which training (often designed & arranged by instructors) is focused on improving particular tasks necessary for improving performance & advancement to the level of expert; requires structure, feedback, & opportunity for refinements

  \[KA \text{Ericsson et al. 1993, } KA \text{Ericsson 2008}\]
COMPETENCY-BASED/MASTERY LEARNING
DEFINITION & TWO ESSENTIAL ELEMENTS

- **Competency-based learning** refers to systems of instruction & assessment based on learners demonstrating that they have acquired the KSAB they are expected to acquire as they progress through their education.
  - Ensures learners achieve what they are expected to achieve
  - Provides detailed information about learner progress in order to identify academic strengths & weaknesses & specific concepts & skills learners have not yet mastered
  - Equivalent terms are *mastery-*-, proficiency-, outcome-, performance-, and standards-based learning

“Competency-Based Learning” [http://edglossary.org](http://edglossary.org) 2014

- Per Bloom, the two essential elements of “mastery learning” are:
  - Feedback ("feedback, corrective, enrichment process")
  - Instructional alignment
COMPETENCY-BASED CURRICULUM VS. TRADITIONAL CURRICULUM

Unlike a traditional curriculum, in a competency-based curriculum:

- Learner need at end of training, not teacher convenience, determines structure & implementation
- Focus is on performance & outcomes, not experience alone
- Guidelines & objectives drive learning, not local expertise
- Learning experiences are standardized & structured, utilize deliberate practice, & take into consideration learner flow
- Feedback is frequent & assessments are used as learning tools
- Learners are evaluated against a fixed standard or criterion rather than against each other
- Cooperation trumps competition among learners
COMPETENCY-BASED LEARNING: RATIONAL IN MEDICINE

- Competent clinicians demonstrate certain “core” knowledge, skills, attitudes, & behaviors (KSAB)
- One can organize these core KSAB within standardized categories or (core) competencies
- Graduating students & trainees must demonstrate core KSAB appropriate for their level of training
- Clinicians work in teams & their success depends to a large degree on their ability to cooperate with others
- Competency-based learning—beginning with the end in mind—ensures assessment of all core KSAB necessary to be a competent physician (e.g., all 6 ACGME “competencies” or medical school “EPOs”)
GME (RESIDENT & FELLOW) & UME (MEDICAL STUDENT) PROGRAM GOALS

ACGME Outcome Project & OUCOM Educational Program Objectives

“Begin with the end in mind” – Stephen R. Covey

- Provide resources & opportunities to enable each trainee & student to achieve excellence in the 6 ACGME competencies or OUCOM educational program objectives (EPOs)

<table>
<thead>
<tr>
<th>ACGME Competency</th>
<th>OUCOM EPO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient care</td>
<td>Same</td>
</tr>
<tr>
<td>Medical knowledge</td>
<td>Same</td>
</tr>
<tr>
<td>Practice-based learning &amp; improvement*</td>
<td>Same</td>
</tr>
<tr>
<td>Interpersonal &amp; communication skills</td>
<td>Communication</td>
</tr>
<tr>
<td>Professionalism</td>
<td>Same</td>
</tr>
<tr>
<td>Systems-based practice**</td>
<td>Same</td>
</tr>
</tbody>
</table>

*PBLI = evidence-based medicine, quality improvement, & research

**SBP = cost-effectiveness, team skills, patient safety, handovers
CURRICULUM ALIGNMENT: CONSEQUENCES

- Guarantees success*
- Removes guesswork from learner studying
- Enhances learner focus on course material
- Removes subjectivity from grading
- Is the responsibility of the course director**
- Causes a domino effect with major implications for course administration

*Success = the learner achieves what the course director determined learners should achieve (“you get what you reward”)

**And no one else
CURRICULUM ALIGNMENT: THE FALLING DOMINOES

Curriculum alignment is only effective if you:

- Notify learners & instructors of objectives in advance
- Teach to the test (ensure learning aligns w/objectives & assessments)
- Discourage teaching that contradicts objectives & assessments
- Exclude noncompliant & incompetent instructors
- Enforce standardized-learning schedule
- Base assessments on standardized learning
- Create assessments internally
- Use criterion-referenced grading (no bell-shaped curve)
THE ABCs OF MEDICAL EDUCATION: 10 ESSENTIAL FEATURES

- Alignment of curriculum
- Blended learning environment
- Core content
- Consistency in three dimensions
- Deliberate practice
- Experiences affirm curriculum
- Formative & summative assessments
- Grading criterion referenced
- Homogeneity
- Institutional support

David Lee Gordon
## ALIGNMENT OF CURRICULUM

*Give learners structure & direction*

### Define, Determine, Delineate

<table>
<thead>
<tr>
<th>Step</th>
<th>Objectives</th>
<th>Define the target</th>
<th>Meaningful, practical, pertinent, assessable, comprehensive (KSAB in all “competencies/EPOs”).</th>
</tr>
</thead>
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<tr>
<td>Step 1</td>
<td>Objectives</td>
<td>Define the target</td>
<td>Meaningful, practical, pertinent, assessable, comprehensive (KSAB in all “competencies/EPOs”).</td>
</tr>
<tr>
<td>Step 2</td>
<td>Assessments</td>
<td>Determine the outcome</td>
<td>Learner- &amp; objective-specific evaluations. Formats vary based on corresponding objective.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Learning</td>
<td>Delineate the path</td>
<td>Standardized experiences. Consistent with objectives &amp; assessments.</td>
</tr>
</tbody>
</table>

*Objectives drive the process. Milestones are staged objectives. Assessment drives learning.*
ALIGNMENT OF CURRICULUM

Make learning objectives assessable

- Write “learning” objectives from perspective of learner—not from perspective of instructor or program; for guidance, preface learning objectives with the following phrase:
  - At the end of the experience/curriculum, the learner will be able to…

- Write learning objectives with assessments in mind—objectives have no purpose without assessment
  - Objectives must contain active, assessable verbs
  - Assessments must be feasible

- Write learning objectives for each learning experience and ensure experience affords opportunity to achieve objectives
ALIGNMENT OF CURRICULUM

Use appropriate verbs when writing objectives

- Examples of INCORRECT learning objectives:
  - Teach the management of stroke… (instructor perspective)
  - Understand/know the management of stroke…(not assessable)
  - Manage stroke…(not feasible if learners are students)
  - Counsel caregivers about brain death (not feasible if based on ward experience alone)

- Examples of CORRECT learning objectives:
  - Describe the management of stroke
  - List the components of stroke management

- Match objective verb to objective type:
  - K – Compare, describe, distinguish, explain, identify, list, name
  - S – Assess, demonstrate, detect, employ, evaluate, interpret
  - AB – Demonstrate, employ, implement, interpret, perform, use
BLENDED LEARNING ENVIRONMENT

Base learning experience & assessment strategy on objective type & learner level of training

- Objective type
  - K—lectures, small groups, readings, written tests, oral exams
  - S—patients, SP/OSCE, simulation, multimedia/web
  - AB—patients, SP/OSCE, readings, essays, discussions

- Level of training – per Miller’s Pyramid of Competence

<table>
<thead>
<tr>
<th>Level</th>
<th>Performance assessment in vivo</th>
<th>Performance assessment in vitro</th>
<th>Clinical-context-based tests</th>
<th>Factual tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knows</td>
<td>Observation, undercover SP/video, logs</td>
<td>OSCE, SP, simulator, case-based test</td>
<td>MCQ, essay, oral</td>
<td>MCQ, essay, oral</td>
</tr>
<tr>
<td>Knows How</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shows How</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

PATIENTS

SIMULATION

TEST

SP = standardized patient; OSCE = objective structured clinical exam

GE Miller 1990, V. Wass et al. 2001
**BLENDED LEARNING ENVIRONMENT**

*Gradually push learner up the “flow channel”*

Putting learner into optimal learning environment (flow channel) requires appropriate blend of challenges matched to learner skill level and requires goals, structure, & feedback.

- The 2 essential components of mastery learning are also essential in flow theory:
  - Curriculum alignment (goals & structure)
  - Feedback
- Gradually ➰ challenge difficulty:
  - To enable learner’s perceived skill level to keep pace and, thereby,
  - For learner to remain in flow as s/he progresses from novice to intermediate to advanced (up the flow channel)
- This process guarantees learners grow to their maximal skill level

NOV = Novice learner
INT = Intermediate learner
ADV = Advanced learner

*After M Csikszentmihalyi 1990*
CORE CONTENT

Point learners in the correct direction

- Learning objectives & curriculum alignment give learners direction—assessing only core content ensures learners go in correct direction
- Base objectives & assessments on core content only
- Publicize this fact to learners & teachers
- Discourage teaching contrary to core content
- Encourage teaching supplemental to core content, but do not assess learners on supplemental content
- Assessing only core content facilitates learner flow, leads to improved:
  - Retention of knowledge & skills
  - Learner confidence
  - Enthusiasm for the topic
  - Comprehension of supplemental learning

Providing “skeleton” enables learner to add “flesh.”
Course director ≡ book editor (not just lecture organizer).
CONSISTENCY IN 3 DIMENSIONS

Align extramurally & intramurally (latitude & longitude)

- Extramural consistency
  - Base course (objectives) on consensus statement
  - Obtain external review (esp. of objectives)

- Intramural consistency
  - Latitudinal consistency (across the same year)
    - Intradepartment – hidden curriculum, multiple clinical sites
    - Interdepartment
  - Longitudinal consistency (year to year)
  - Requires extensive communication and cooperation among course directors and faculty—and is most effective with institutional direction and oversight
DELIBERATE PRACTICE

Realize “perfect practice makes perfect” (Vince Lombardi 1913-1970)

“Experience itself teaches nothing” (W. Edwards Deming, 1900-1993)

- Deliberate practice = focused, repetitive practice in which training (often designed & arranged by instructors) is focused on improving particular tasks necessary for improving performance & advancement to the level of expert

- Essential components of deliberate practice are consistent with flow and competency-based learning and include:
  - Motivated & attentive learner (learner in “flow”)
  - Well-defined task & goals (standardized curriculum, learning objectives)
  - Appropriate level of difficulty (flow channel)
  - Informative feedback from educational sources (supervised structure)
  - Opportunities for repetition & refinements (simulation with feedback)

Modified from Ericsson et al. 1993; Ericsson. 2008; McGaghie et al. 2011
DELIBERATE PRACTICE

Use simulation for practical implementation

- Clinical environment alone is not conducive to consistent & comprehensive implementation of deliberate practice
- Standardized curriculum that includes simulation is the only practical solution for implementation
  - Standardized patients (SPs)
  - Objective structured clinical exams (OSCEs)
  - Low-fidelity & high-fidelity simulators
  - Oral & written patient presentations
  - Case-based learning
  - Role-playing
  - Gaming
  - Multimedia – videos, avatars, etc.
  - Online delivery

Simulation for deliberate practice is especially necessary when learner is at “shows how” level of competence in Miller’s Pyramid for a specific objective, e.g., breaking bad news

WC McGaghie et al. 2011
“S.M.A.R.T.” Clinical Teaching

The 5 components of effective clinical teaching

S - Set expectations
M - Model positive behavior
A - Affirm declared curriculum
R - Repeat feedback
T - Target your audience(s)

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EXPERIENCES AFFIRM CURRICULUM
Create a positive learning environment & be S.M.A.R.T.

SET EXPECTATIONS
- Establish structure in order to facilitate “flow,” “deliberate practice,” & “competency-based learning”
- Define roles of team members
- Define goals of the learner(s)
- Define responsibilities of the learner(s)
- Define your responsibilities in terms of patient care, teaching, and team leadership
- Define expectations of behavior and professionalism
MODEL POSITIVE BEHAVIOR

- Be aware you are always on stage (i.e., you’re the hidden curriculum)
- Establish & model a positive learning environment that encourages admitting ignorance, asking questions, seeking answers
- Use a standardized, respectful approach in ALL interactions with patients, caregivers, learners, other health professionals (e.g., AIDET)
- Avoid:
  - Derogatory comments about others & be aware of personal stress & bias & the influence of conformity in making your comments
  - Promoting competition over collaboration, & intentional humiliation
  - Dishonesty & cynicism
- Model etiquette in team activities & documentation
  - Team activities – stay engaged, ask questions, avoid looking at phone
  - Documentation – no cutting and pasting, no negative comments
**AFFIRM DECLARED CURRICULUM**

- Be familiar with declared/formal curriculum content, learning objectives, and schedule
- Teach content consistent with declared curriculum
- Never contradict the declared curriculum
- Teach content supplemental to the declared curriculum content if you:
  - Feel learner has mastered core content
  - State clearly that the knowledge or skill is supplemental
EXPERIENCES AFFIRM CURRICULUM
Create a positive learning environment & be S.M.A.R.T.

REPEAT FEEDBACK

- Give prompt feedback concerning potentially unprofessional behavior (“what you permit, you promote”)
- Use feedback to motivate learner (“assessment drives learning”)
- Facilitate “flow,” “deliberate practice,” & “competency-based learning” with frequent feedback
- Give frequent, task-specific feedback
  - Preparation for rounds – knowledge of patient & medical record
  - Participation in rounds – patient presentations, asking questions
  - Progress notes – meaningful and clear information
- Complete graded evaluations with learner present in order to provide timely feedback
EXPERIENCES AFFIRM CURRICULUM

Create a positive learning environment & be S.M.A.R.T.

TARGET YOUR AUDIENCE(S)

- Keep in mind learner training level & “flow”
- Maintain support-challenge balance (“flow” from teacher’s perspective)
- Use these teaching strategies
  - Priming – prepare learner for a task
  - Modeling – explain decisions & actions (think out loud)
  - Personalization – make situation pertinent for learner
  - Anecdote – tell stories consistent with evidence/best practice for improved understanding & retention
  - Dogma – maintain simplicity & consistency
- Keep students busy – teach or assign tasks

Top Graph after M Csikszentmihalyi, 1990
Bottom Graph after DJ. Bower, et al., 1998
EXPERIENCES AFFIRM CURRICULUM
Create a positive learning environment & be S.M.A.R.T.

“S.M.A.R.T.” Clinical Teaching (per DLG)

Set expectations…define learner responsibilities on day 1

Model positive behavior…use hidden curriculum for good, not evil

Affirm declared curriculum…supplement, never contradict

Repeat feedback…motivate & provide opportunity for improvement

Target your audience(s)…consider learner training level & flow

1. Facilitate flow & deliberate practice through structure (S), feedback (R), and appropriate challenge-skill balance (T).
2. Ensure the hidden curriculum is consistent with the declared/formal curriculum (M) & (A).
Assessment drives learning.

Thus, assessments are learning tools & “teaching to the test” is optimal.*

- Assessment content
  - Base only on learning objectives to ensure learner growth & advancement up the “flow channel”

- Assessment features unrelated to content
  - Type (formative/feedback & summative/graded)
  - Validity (appropriateness)
  - Reliability (consistency)
  - Feasibility (practicality)

*BS Bloom 1968
V Wass et al. 2001
TR Guskey 2007
FORMATIVE & SUMMATIVE ASSESSMENTS

Give frequent, scheduled feedback & only test objectives

- **Formative assessment**
  - Feedback without or with grade
  - Intermediate gauge of learner’s progress

- **Summative assessment**
  - Graded testing without or with feedback
  - Outcome measure of learner’s KSAB acquisition

- **Keys to effective implementation**
  - View assessments as learning tools
  - Formative – **schedule** frequent feedback opportunities
  - Summative
    - Make pertinent – only assess **core** content/objectives
    - Use **criterion**-referenced (not **norm**-referenced) grading
    - Monitor results for course QI (curriculum evaluation)

*Note that a specific assessment may be both formative & summative*

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After BS Bloom 1968; V Wass et al. 2001; TR Guskey 2007
FORMATIVE & SUMMATIVE ASSESSMENTS
Assess entrustable professional activities (EPAs)

- Use scale for formative & summative assessment of learner’s ability to perform a core clinical activity (EPA) independently

- Entrustment (supervision) scale:
  1. Not ready for entrustment
  2. Ready for direct supervision
  3. Ready for indirect supervision
  4. Ready for unsupervised practice
  5. Ready to supervise others

After O ten Cate, lecture at ACGME conference 2015 & HC Chen et al. 2015
Use criterion-referenced grading to assess competence.

**NORM-REFERENCED GRADING**
Comparison to other learners

**CRITERION-REFERENCED GRADING**
Comparison to fixed standards (competence)

*Figures from TR Guskey 2007*

In criterion-referenced grading, the director predetermines standards for grades & the curve is shifted to the right, but there are still high, average, & low performers (scalar grading).
<table>
<thead>
<tr>
<th>Norm-Referenced Grading</th>
<th>Criterion-Referenced Grading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learner grade based on performance vs. performance of other examinees</td>
<td>Learner grade based on performance vs. course director’s standard/criterion</td>
</tr>
<tr>
<td>Purpose is to discriminate</td>
<td>Purpose is to assess “competence”</td>
</tr>
<tr>
<td>✓ Normative (relative)</td>
<td>✓ Mastery (absolute)</td>
</tr>
<tr>
<td>✓ Bell-shaped curve</td>
<td>✓ Bell-shaped curve skewed to right</td>
</tr>
<tr>
<td>✓ Guaranteed some will fail</td>
<td>✓ Most perform well, all may pass</td>
</tr>
<tr>
<td>Items assess broad content not known to learner in advance</td>
<td>Items assess learning objectives known to learner in advance</td>
</tr>
<tr>
<td>Inconsistent w/ curriculum alignment &amp; competency-based education (exam items not linked to objectives)</td>
<td>Consistent w/ curriculum alignment &amp; competency-based education (exam items linked to objectives)</td>
</tr>
<tr>
<td>Learners study independently, ignore what is taught by instructors</td>
<td>Learners study what is taught by instructors</td>
</tr>
<tr>
<td>Feedback not linked to performance</td>
<td>Feedback linked to performance</td>
</tr>
<tr>
<td>Promotes competition</td>
<td>Promotes cooperation</td>
</tr>
</tbody>
</table>

…and cooperation seen as cheating
GRADING CRITERION REFERENCED

You get what you reward. Is the college weeding-out process (based on norm-referenced grading) valid & effective?

Pre-Med / College | UME (Medical School) | GME (Residents/Fellows) | Practitioner / Boards

ESTABLISH LEARNER COMPETENCE

WEED OUT LEARNERS

WORK ALONE

NORM-REFERRED ASSESSMENTS

Reinforces Win/Lose…
Promotes competition

NORM- & CRITERION REFERENCED ASSESSMENTS

CRITERION-REFERENCED ASSESSMENTS

Reinforces Win/Win…
Promotes cooperation

Norm-referenced grading in college & medical school promotes competition, but physicians practice in teams (systems) that necessitate cooperation (systems-based practice).
HOMOGENEITY

Enforce standardized (equivalent) core curriculum for all learners

- Curriculum based on mastering core content & deliberate practice requires that ALL learners receive an equivalent—homogeneous or standardized—learning experience

- “Standardized” curriculum
  - Is highly structured
  - Requires mandatory participation & punctual attendance
  - Takes precedence over other experiences (e.g., clinic)
  - Requires full attention of learners (pagers & phones off)
  - Accounts for majority of grade, not necessarily learner time
  - Requires strong, well-organized course director
  - Does not preclude—and actually aids—supplemental learning by advanced learners (“enrichment process” of Bloom)
INSTITUTIONAL SUPPORT

Provide protected time & authority for course director

Recruit, assign, & incentivize faculty based on skills & interests, ensuring plan is financially viable (mission-based hiring).

Identify & support appropriate curriculum champion.

- Delegate (vs. relegate) director who has:
  - Both teaching & administrative/leadership skills
  - Mettle & motivation
  - Protected time & authority to exclude noncompliant/incompetent faculty

- Establish educational committees

- Protect didactic schedule in clinical rotations—attendance w/o pagers

- Provide resources
  - Director 10-50% FTE, coordinator 10-50% FTE depending on program size
  - Simulation costs, e.g., SPs, OSCEs, skills center
  - Instructors (faculty / residents / nurses / graduate students / et al.)
  - Books, electronic tablets, travel, etc.
MEDICAL EDUCATION ESSENTIALS
Absence of any of the 10 ABCs limits curriculum success

- Alignment of curriculum – structure & direction
- Blended learning environment – pyramid of competence & flow
- Core content – the correct direction / skeleton
- Consistency in 3 dimensions - extramural & intramural (lat./long.)
- Deliberate practice – goals, structure, feedback, & simulation
- Experiences affirm curriculum – learning environment, SMART
- Formative & summative assessments – feedback, grades, learning tools
- Grading criterion referenced – competence & cooperation
- Homogeneity – standardized/equivalent core curriculum for all
- Institutional support – protected time & authority for director
OU NEUROLOGY
MEDICAL STUDENT EDUCATION
Neurologic exam training – M1 & M2
- M1s – Essential neurologic exam video-based lecture
- M2s – Neurologic Idol Season 9 in 11/2015
  - In CM (Clinical Medicine) course, during Neurosciences block

Neurosciences – M2
- New curriculum 2011 (“2010 curriculum”), Dir. Robert Blair
  - 2012 (co-dir. TAR), 2013 (co-dir. AJV, DGC, DLG), 2014 (co-dir. AJV)
  - 2015—AKF co-director; remains 10 weeks; 10/12 -12/18/2015
- Guiding principles: integration, core content, curriculum alignment
  - Anatomy/physiology & pathology/pathophysiology
  - Basic science & clinical medicine
  - Neurology & psychiatry
  - Limited number of faculty w/ preference for generalists over specialists
  - Directors review content & objectives of lectures, match to quiz/test Qs

Capstone – M2
- Focal weakness lecture & case – DLG
OUCOM BASIC SCIENCE COURSES
2015 AAMC Graduation Questionnaire (Neurosci 2012): Ratings by Students on 4-Point Scale
OUCOM BASIC SCIENCE COURSES

2015 AAMC Graduation Questionnaire (Neurosci 2012):
% Students Rating Educational Quality Excellent

OUCOM  ALL LCME


20.8  25.0  28.8  53.2  64.6  77.5  53.6  59.1  53.2
OU NEUROLOGY MEDICAL STUDENT EDUCATION
3RD & 4TH-YEAR STUDENTS

- Neurology clerkship – M3
  - M3 mandatory clinical rotation
  - Introduced standardized, competency-based curriculum 2007-8 w/ DLG as director (highest rated clerkship since)
  - Increased length from 2 to 4 weeks in 2009-10
  - Effective 2014, AJV director, DLG co-director, ASC associate director

- Neurology electives – M4
  - M4 only, variable clinical & research curricula, 2-4 weeks
  - Both OU and visiting students
  - AJV director for all electives

- Capstone course – M4
  - Handover/case summary training (AJV)
Minimum body of clinical neurology skills and knowledge required of all graduating medical students, regardless of their eventual career path.

General principles and systematic approach to patients with neurologic symptoms and signs, rather than a large body of disease-specific facts.

Specific conditions are emphasized only if they are common, illustrate essential concepts, or require urgent management.

Gelb et al., 2002

“Begin with the end in mind” – Stephen R. Covey
OU NEUROLOGY CLERKSHIP: GOALS / GLOBAL OBJECTIVES

1. Perform accurate & appropriate neurologic exam
2. Identify & describe significance of key neurologic findings
3. Describe pathophysiology, clinical course, & management of common neuro conditions & key neuro emergencies
4. Distinguish normal & abnormal CT & MRI scans of brain
5. Communicate effectively about neurologic patients

Based on AAN core curriculum. Specific skills & cognitive learning objectives are matched to the school-wide 6 competencies.
OU NEUROLOGY CLERKSHIP: STANDARDIZED CURRICULUM

- History Taking
- Lesion Localization
- Essential Neuro Exam
- Essential Neuro Findings
- Brain Imaging
- Case Summaries
- Patient-Centered Articles
- Aphasia & Coma SPs
- Ward-Based Learning
- Interdisciplinary Team
- Ethics & Professionalism
- Case-Based Learning

All supporting materials are on student website, http://hippocrates.ouhsc.edu/

Standardized curriculum accounts for < 20% of student’s on-campus time & 90% of student’s grade
OU NEUROLOGY CLERKSHIP: CASE-BASED LEARNING (CBL)

Standardized Format
- Written by directors, reviewed by faculty & educators
- Systematic, interactive; led by select faculty; post-session quizzes

20 Cases
- Format – 10 instructor led (unknowns), 10 self learning (web)
- PDF handouts for all 20 on web

Emergency conditions
1. Acute ischemic stroke
2. Subarachnoid hemorrhage
3. Spinal cord compression
4. Transtentorial herniation
5. Generalized status epilepticus
6. Toxic-metabolic encephalopathy
7. Subdural hematoma
8. Myasthenia gravis
9. Guillain-Barré syndrome
10. Acute bacterial meningitis

Outpatient conditions
1. Parkinson disease
2. Alzheimer disease
3. Migraine headache
4. Complex-partial seizure
5. Multiple sclerosis
6. Cervical radiculopathy
7. Lumbosacral radiculopathy
8. Benign positional vertigo
9. Obstructive sleep apnea
10. Herpes zoster
# OU Neurology Clerkship: Sample 4-Week Student Schedule

<table>
<thead>
<tr>
<th>Orientation</th>
<th>History</th>
<th>Case Summaries</th>
<th>Localization</th>
<th>Neuro Exam</th>
<th>OU Clinic</th>
<th>CBL</th>
<th>Findings Quiz</th>
<th>Imaging Quiz</th>
<th>CBL Quiz</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBL</td>
<td>Ward-Based Learning</td>
<td>★</td>
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<tr>
<td>Submit SICEF</td>
<td>CBL Quiz</td>
<td>CBL Quiz</td>
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<tr>
<td>Interdisciplinary Game &amp; Quiz CBL</td>
<td>CBL Quiz</td>
<td>CBLQuiz</td>
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</tbody>
</table>

- **CBL** = case-based learning
- **SP** = standardized patient
- **SICEF** = student-instructor contract & evaluation form

- Course Review
- Case Summary Assessments
- Submit SICEF

- Final Exam
- OSCE
- Course Evals
Comments by residents & attendings (mandatory)

- Comments are mandatory for a reason
- Qualitative assessments are very valuable in determining learner performance
- Select comments are included in the end-of-rotation summary assessment on MedHub
- MedHub comments are included in student’s Dean letter
- Use descriptive adjectives (e.g., bright, motivated, hard working), avoid nondescript adjectives (e.g., good, fair)
- Use descriptors unique to the student to facilitate a true understanding of student personality and performance (e.g., “soft-spoken, but not shy; did not hesitate to ask questions and very involved in patient care”)
OUCOM-OKC NEUROLOGY CLERKSHIP

Highest Student Ratings at OUCOM-OKC

AAMC Graduation Questionnaire

- 4 Excellent
- 3 Good
- 2 Fair
- 1 Poor

New curriculum (clerkship ‘07-’08)
Rotation increased from 2 to 4 weeks
OUCOM-OKC NEUROLOGY CLERKSHIP
Student Ratings Far Exceed National Average

AAMC Graduation Questionnaire—% students rating education quality good or excellent

- 2015 OUOM: 81.9% excellent, 18.1% good.
- 2015 Other Neurology Clerkships: 38.2% excellent, 37.6% good

- New curriculum (clerkship ‘07-’08)
- Perfect top-box scores in 2013 & 2015
OUCOM-OKC NEUROLOGY CLERKSHIP
Every Year, Rated Excellent by Over 75% of Students

AAMC Graduation Questionnaire—% students rating education quality good or excellent

New curriculum (clerkship ‘07-'08)
100% of students rated it good or excellent in 2013 & 2015
OU COM STUDENTS MATCHING IN NEUROLOGY OR CHILD NEUROLOGY

New clerkship curriculum

0 1 2 2 1 1 0 6 8 6 10 8 8 7 5

Projected
## EFFECT OF COMPETENCY-BASED CURRICULUM

### STUDENT TEACHING AWARDS

<table>
<thead>
<tr>
<th>TEACHING AWARD</th>
<th>Before 2007</th>
<th>After 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUCOM Stanton L. Young Master Teacher Award (f. 1984)</td>
<td>Peggy W. Wisdom 1996</td>
<td>Herman E. Jones 2009</td>
</tr>
<tr>
<td></td>
<td></td>
<td>David Lee Gordon 2011</td>
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<tr>
<td>OUCOM Edgar W. Young Lifetime Achievement Award (f. 1987)</td>
<td></td>
<td>Herman E. Jones 2011</td>
</tr>
<tr>
<td>OUCOM M2 Aesculapian Award – To Faculty (f. 1962)</td>
<td>Herman E. Jones 2006</td>
<td></td>
</tr>
<tr>
<td>OUCOM M3 Aesculapian Award – To Resident (f. 1975)</td>
<td>Gunter Haase 1964</td>
<td>Anthony J. Vaughn 2011</td>
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<tr>
<td></td>
<td></td>
<td>Anthony J. Vaughn 2012</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anthony J. Vaughn 2013</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aaron K. Farrow 2014</td>
</tr>
<tr>
<td>OUCOM M4 Aesculapian Award – To Faculty (f. 1962)</td>
<td></td>
<td>Herman E. Jones 2009</td>
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<tr>
<td></td>
<td></td>
<td>David Lee Gordon 2012</td>
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<tr>
<td></td>
<td></td>
<td>Anthony J. Vaughn 2015</td>
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<tr>
<td>AAN Clerkship Directors Teaching Award (f. 2011)</td>
<td>—</td>
<td>David Lee Gordon 2014</td>
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<tr>
<td></td>
<td></td>
<td>Aaron K. Farrow 2015</td>
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</tbody>
</table>
OU NEUROLOGY RESIDENCY EDUCATION
OU NEUROLOGY RESIDENCY: PROGRAM GOALS
Facilitated by ACGME Outcome & Milestones Projects

“Begin with the end in mind” – Stephen R. Covey

- Provide resources & opportunities to enable each resident to achieve excellence in the 6 ACGME competencies
  - Patient care
  - Medical knowledge
  - Practice-based learning & improvement*
  - Interpersonal & communication skills
  - Professionalism
  - Systems-based practice**

- Assist each resident in achieving the ability to function independently as a neurologist by the time of graduation

*PBLI = evidence-based medicine, quality improvement, & research
**SBP = cost-effectiveness, team skills, patient safety, handovers
OU NEUROLOGY RESIDENCY: LEADERSHIP & COMMITTEES

Leadership

- Program Director (PD) .................. Shuchi Chaudhary, MD
- Associate PD .............................. Christi M. Pendergraft, MD
- Chair ........................................... David Lee Gordon, MD
- Program Coordinator ................. Carole J. Clark
- Administrative Chief Resident ....... Jaclyn D. Duvall, MD
- Asst. Administrative Chief Resident .. Chad J. Stuckey, MD

Committees

- Residency Recruiting Committee
- Program Evaluation Committee (PEC)
- Clinical Competency Committee (CCC)

*The PD appoints the PEC and CCC members. PEC must include a resident. CCC cannot include a resident.*
ACGME COMMON PROGRAM REQUIREMENTS

PROGRAM EVALUATION COMMITTEE

- Plan, develop, implement, and evaluate educational activities of the program
- Review and make recommendations for revision of competency-based curriculum goals and objectives
- Ensure compliance—and address noncompliance—with ACGME standards, including the CLER (Clinical Learning Environment Review) program with emphasis on 6 quality-&-safety focus areas
  - Patient safety
  - Quality improvement / Healthcare quality
  - Transitions in care / Care transitions
  - Supervision
  - Duty hours, fatigue management & mitigation
  - Professionalism
ACGME COMMON PROGRAM REQUIREMENTS

CLINICAL COMPETENCY COMMITTEE

- Review all resident evaluations at least semiannually
- Advise program director regarding resident progress (promotion, remediation, dismissal)
- Report “milestones” evaluations of each resident to ACGME semiannually (Nov 1-Dec 31 & May 1-June 15)

Milestones = ACGME next accreditation system

- System for measuring & reporting of outcomes
- Neurology RRC developed 29 neurology-specific milestones
- For each milestone, resident evaluated for expected level of performance
  1. Typical graduating medical student
  2. Resident during the program, but not yet at mid-residency level
  3. Resident during the program and demonstrates majority of milestones
  4. Graduating resident
  5. Advanced, specialist resident or practicing physician
OU NEUROLOGY RESIDENCY: ATTENDING SUPERVISION

- Ultimate responsibility for all aspects of patient care lies with the attending.

- Attendings should delegate—but never abdicate—responsibility for decision making & patient care to a resident in order to avoid:
  - Resident-to-resident teaching that deviates from optimal practice guidelines
  - Degradation of attending knowledge, skills, future teaching ability
  - Poor quality patient care, risks to patient safety, risk of liability

- Optimally, all clinical decisions should be:
  - Made by attending
  - Discussed by attending with residents to facilitate resident understanding of attending decisions and attending growth through resident input (“modeling”)

- Attendings should communicate directly w/ other services
## OU Neurology Residency: P2-4 Rotations Weeks Per Year (2015-2016)

<table>
<thead>
<tr>
<th>PGY-2</th>
<th>PGY-3</th>
<th>PGY-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSICU – 8-10</td>
<td>NSICU – 4-7</td>
<td>NSICU – 5-6</td>
</tr>
<tr>
<td>OU Admit – 8-10</td>
<td>Child – 10-12</td>
<td>OU Admit – 10-11</td>
</tr>
<tr>
<td>OU Consult – 8-10</td>
<td>Child Epilepsy – 4-5</td>
<td>OU Consult – 9-10</td>
</tr>
<tr>
<td>VAMC – 8-10</td>
<td>EEG/EMU – 5-7</td>
<td>VAMC – 9-11</td>
</tr>
<tr>
<td>Neuropathology – 4-5</td>
<td>EMG – 5</td>
<td>Elective – 11-12</td>
</tr>
<tr>
<td>Psychiatry (Jul-Dec) – 4-5</td>
<td>Neuro-ophtho – 4-5</td>
<td>Neuro-ophtho – 5</td>
</tr>
<tr>
<td>Subspecialty clinic (Jan-Jun) – 4-6</td>
<td>Night float (OU Adult) – 10-11</td>
<td>Leave – 4</td>
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<tr>
<td>Night Float (VA/Child) – 4-6</td>
<td>Night float (VA/Child) – 5-6</td>
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<tr>
<td>Leave – 4</td>
<td>Leave – 4</td>
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</table>

Schedule modified to accommodate 5 residents in P3 and P4 years.

*P3 and P4 residents are on 5-week rotations.*

*P2 residents are on 4-week rotations.*

*Only one P3 on Child each rotation.*

*No leave in July.*

*P2s take leave on Neuropathology, Psychiatry, or Subspecialty Clinic.*

*P3s take leave on EMG or Neuro-ophtho.*

*P4s take leave on Neuro-ophtho or Elective.*
OU NEUROLOGY RESIDENCY: GLOBAL LEARNING OBJECTIVES

- Based on ABPN objectives and ACGME core competencies
- Linked to year and rotation
- Created & revised annually by PEC, including program director, chair, & chief resident(s)
- Match rotation-specific objectives
OU NEUROLOGY RESIDENCY:
DIDACTIC CURRICULUM TIMELINE

There are conferences at 8A most days & 12P most Mon, Wed, Fri

<table>
<thead>
<tr>
<th>JUL</th>
<th>AUG</th>
<th>SEP</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>Outpatient Skills</td>
<td>Leadership Skills</td>
<td>Intro Series</td>
<td>Annual Conference Series with Journal Clubs</td>
<td>Finances/Regulations</td>
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<tr>
<td>P2 Essentials</td>
<td>Level-specific Readings &amp; Quizzes (self study)</td>
<td></td>
<td>Handovers</td>
<td>Grand Rounds</td>
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<tr>
<td>Morning Reports (Child &amp; Adult) – weekly</td>
<td>Clinical Chief Rounds with Chair – average biweekly</td>
<td></td>
<td>Morbidity, Mortality, Quality Improvement (MMQI) Case Conferences – monthly</td>
<td>Resident Meetings – monthly</td>
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<td></td>
<td>OUMC &amp; VAMC Inpatient Service Meetings with QI Reports – monthly</td>
<td>Program Director-P2 Meetings – monthly</td>
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<td></td>
<td>Program Director-Administrative Chief Resident Meetings – monthly</td>
<td>Rotation-specific Curricula – Pathology, Psychiatry, Subspecialty Clinic, VA Rehab</td>
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## OU Neurology Residency: Assessments Overview

### Summative
- **360-degree evaluations**
  - Faculty rotation evaluations
  - Peer & self evaluations
  - Patient/caregiver evaluations
  - Nurse evaluations
- **NEX sessions**
- **Quizzes**
  - Essentials of neurology (P2)
  - Pathology (P2)
  - Psychiatry (P2)
  - Subspecialty clinic (P2)
  - Self-study level-specific readings (P2-P4) – voluntary

### Formative
- **Handover sessions**
- **Morning reports**
  - Child
  - Adult
- **Doctoring skills**
- **Journal clubs**
- **ASP presentations**
- **Clinical chief rounds**
- **PD/Chair feedback sessions**
OU NEUROLOGY RESIDENCY: ACCOMPLISHMENTS

- From 2007 to 2011, increased resident complement from 3.5 to 6 per year (total 14 to 24)
- In 2008, initiated innovative, competency-based curriculum with annual improvements based on resident feedback
- Residents exceeding national average on resident in-training exam (RITE) every year since new curriculum implemented in 2007-2008
- Neurology boards pass rate 97% (33/34) since new ABPN process (for residents who began P2 ≥ 7/1/2005)
OU NEUROLOGY RESIDENCY:
PROGRAM IMPROVEMENTS 2015-2016

- Administrative
  - Appointed 2 administrative chief residents, P4 plus P3 assistant chief
  - Began monthly meetings of PD & administrative chiefs
- Clinical
  - Changed morning handover times for OU Admit & Child Neurology
  - Hired PA to perform H&Ps for both adult & child EMU patients and assist with child neurology consults when resident in clinic
  - Randomized patient assignments in OU COC clinic
- Curricular
  - In “Introduction to Neurology” series, added 3 new cases (acute ischemic stroke, status epilepticus, cerebral herniation) & provided more time for adult & child neuropsychiatric cases
  - Improved pathology, psychiatry, & subspecialty clinics curricula
  - Formalized curricula for angio, stats, EMG, movement disorders skills sessions
  - Modified annual conference series based on resident lecture evaluations
  - Changed QI reports from resident meetings to service meetings
  - Decreased didactic sessions & requirements
    - Eliminated NSICU skills
    - Eliminated most TUE & THU didactic sessions (no RITE or MCQ sessions; changed journal clubs from weekly to monthly and integrated into annual conference series)
    - Modified journal club format
    - Changed level-specific readings and quizzes to voluntary
OU NEUROLOGY RESIDENCY: UNIQUE STRENGTHS

Inpatient experience, child neurology, diagnostic reasoning, & doctoring skills beyond neurology

- **Inpatient clinical experience** – confidence in ability to manage acute stroke patients (Code Gray Stroke Alerts), critically ill patients (NSICU), and patients in inpatient rehabilitation setting

- **Child morning report / Child float** – comfort with child neurology due to frequent exposure to child neurology throughout residency

- **Adult morning report** – comfort with diagnostic ability (inpatients and outpatients) due to standardized, organized approach to history-taking and neurologic diagnosis

- **Doctoring / Handover skills** – conscious approach to bias in diagnostic reasoning, confidence in ability to educate patients and break bad news, effective communication skills

- **Leadership / Healthcare finances & regulations** – skills and knowledge necessary to succeed in medicine beyond clinical abilities

*Very strong training for those pursuing stroke, critical care neurology, neurointervention, or neurohospitalist careers.*

*Equally strong training for those pursuing academic or community practice.*
Clinical experience has limitations, but extensive didactic training results in confidence with outpatients nonetheless. Graduating residents feel confident in outpatient setting within a few months of graduation.

- **OU continuity-of-care clinic** – indigent patient population with mainly headaches, epilepsy, and multiple sclerosis
- **VA continuity-of-care clinic** – mainly male patients with headaches, back pain, peripheral neuropathy, and tremor and occasional stroke, chronic myelopathies, Parkinson disease, or dementia
- **Subspecialty clinics rotation** – month-long rotation in second half of P2 year with emphasis on dementia, movement disorders, and neuro-oncology
- **Adult morning report** – history-taking and diagnostic skills pertinent for both inpatients and outpatients
- **Case-based learning (P2s)** – ten key outpatient conditions taught in “Essentials” curriculum in July
- **Outpatient skills sessions** – 6 sessions covering practical approaches to neck pain, low-back pain, radiculopathies, myelopathies, movement disorders, dementia, neuromuscular disorders, and psychiatric conditions in neurologic patients
- **Grand rounds** – over 2/3 cover outpatient topics
- **Advanced neurologic skills** - includes monthly exposure to movement disorders
- **Voluntary level-specific readings & quizzes** – emphasize dementia, movement disorders, neuro-oncology
OU NEUROLOGY RESIDENCY RITE RESULTS
Exceed National Average Every Year Since 2008

ALL RESIDENTS, P2 – P4

Average Total % Correct

- ALL OU
- ALL NATL

New curriculum
OU NEUROLOGY RESIDENCY RITE RESULTS
P2s Exceed National Average 6 of 8 Yrs Since 2008

Average Total % Correct

New curriculum
OU NEUROLOGY RESIDENCY RITE RESULTS

P3s Exceed National Average 7 of 8 Yrs Since 2008

New curriculum
OU NEUROLOGY RESIDENCY RITE RESULTS

P4s Exceed National Average 6 of 7 Yrs Since 2009

Average Total % Correct

- P4 OU
- P4 NATL

New curriculum


67 59 70 66 61 72 71 70 70
61 64 64 64 66 66 65 65 65
55 60 65 70 75

OU Neuroscience
OU NEUROLOGY FELLOWSHIPS, ETC.

**Current fellowships***
- Vascular neurology (2/y) – PD EVS
- Endovascular surgical neuroradiology (2 alt. w/ 1/y) – PD AG
- Clinical neurophysiology (2/y) – PD EAD

**Possible future residency/fellowship programs**
- Child neurology
- Behavioral neurology & neuropsychiatry
- Headache medicine
- Neurorehabilitation

*We currently have funding for 5 total fellowship positions annually*
LEARNING OBJECTIVES

At the end of this Grand Rounds, the attendee will be able to:

- Define curriculum alignment and its role in competency-based & mastery learning
- Describe the implications of curriculum alignment in terms of course administration and implementation
- Describe the 10 essential features (ABCs) of medical education
- Describe the 5 components (S.M.A.R.T.) of effective clinical teaching


Chen HC, van den Broek WES, ten Cate O. The case for use of enthrustable professional activities in undergraduate medical education. Acad Med 2015; 90:431-436.


MEDICAL EDUCATION
REFERENCES, 2 of 2

- LCME (Liaison Committee on Medical Education). Functions and Structure of a Medical School. Standards for Accreditation of Medical Education Programs Leading to the MD Degree. Standards and Elements Effective July 1, 2015. March 2014.
THE END