Assessments: The Key to competency-based education

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Coordinator of Curriculum for Undergraduate Orthodontics
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"Some people work very hard but still they never get it right.... Well, I’m beginning to see the light."
Objectives

1. Describe steps in developing competency assessments and instruction
2. Explain how assessments guide instruction
3. Distinguish between attainment and demonstration of competence
4. Discuss challenges
Competency-based Education

- Clearly articulated competencies
- Competencies supported by foundation knowledge, formative experiences, and assessments
- Curriculum leads to competence
- Assessments measure competence
Competency

• Complex behavior or ability
  – knowledge, experience, critical thinking, problem-solving, professionalism, ethical values, technical/procedural skills

• Quality consistent with patient well-being

• Ability to self-evaluate

• Independent, unsupervised at an entry level
Assessments: Inferences

• Purpose? Aptitude, Achievement, Attitude, Competence
• Type: Selected or constructed response, technical skills/procedures/products
• **Grading: Measurement, Rubric, Reliability, Accuracy**
• Prioritize what is important
• Stakes: Consequences
Our Core Competency

• The student will be able to manage patients with malocclusion and/or skeletal problems (MMSP)
Assessments: MMSP

- Foundational Knowledge: D1, D2
- Formative Experiences: D2, D3
- "Competence": D3, D4
Circa 1998 working on the first competency based course at NYUCD
Identify the ultimate outcome(s) being assessed.

Construct an assessment that represents a relevant clinical situation and requires the student to employ (1) key enabling knowledge, (2) subskills, (3) evaluative criteria.

Identify key enabling knowledge, subskills, and develop evaluative criteria essential for mastering the assessment.

Design an instructional module that facilitates attainment (and demonstration) of competence.

Create a companion piece that is content specific and directs teachers and students to reaching instructional targets.
Ultimate Outcomes

• Counsel patients concerning malocclusion and/or skeletal problems
• Consult with specialists
  – Elicit orthodontic/esthetic concerns of the patient
  – Recognize malocclusions and skeletal problems
    • Assess the severity of the condition
  – Integrate Orthodontics in treatment planning
Create a companion piece that is content specific and directs teachers and students to reaching instructional targets.

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Identify the ultimate outcome(s) being assessed.
Age – **11yrs 6 mos**

Chief Concern - “**I need braces because my teeth stick out**”

Past Medical History - **Sickle Cell Anemia.** No History of Any Crises.

Past Dental History - **Routine Dental Visits at NYU Pediatric Clinic**

Other Findings - **Lip Biting, Nocturnal Thumb Sucking, Bruxing**
ORTHODONTICS: Competency Evaluation Form

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Orthodontics (25E, 27A, 21C.vi)

The evaluation criteria itemized below generally describe what is acceptable. For each instance where a listed criterion is not met satisfactorily (i.e., where a critical error occurred), please darken the square preceding the corresponding heading. Then darken one or more circles below the square (where present) to indicate at which point(s) in the procedure (a.b.c,...) the critical error has occurred.

☐ 1. Accurately Elicit and Record Orthodontic Concerns

☐ 2. Accurately Recognize and Record Dental/Occclusal Problems

☐ 3. Accurately Recognize and Record Occlusal Conditions that are Risk Factors for Oral Diseases/Dysfunction

☐ a. Overbite [100%]
☐ b. Overjet [Severe]
☐ c. Open bite
☐ d. Dental Crowding [Severe]
☐ e. Dental Spacing [Severe]
☐ f. Occlusal Interferences resulting in Mandibular functional shifts

☐ 4. Accurately Recognize and Record Skeletal Conditions that are Risk Factors for Oral Diseases/Dysfunction

☐ a. Sagittal Plane [Class II, Class III]
☐ b. Transverse Plane [Asymmetry]
☐ c. Vertical Plane [Lower Facial height]
☐ d. Skeletal Open Bite [Hyperdivergent]
☐ e. Skeletal Deep Bite [Hypodivergent]

☐ 5. Accurately Recognize and Record Functional Conditions that are Risk Factors for Oral Diseases/Dysfunction

☐ a. Labial incompetence
☐ b. Oral Habits
☐ c. Abnormal swallow
☐ d. Abnormal breathing
☐ e. Bruxism
☐ f. Clenching

☐ 6. Accurately Record an Appropriate Problem List and Treatment Objectives

☐ 7. Accurately Record an Appropriate Sequential Treatment Plan

FACULTY EVALUATION: Count total number of shaded boxes (not circles) and write number in box below:

☐ Total No. Critical Errors

Faculty Signature
ASSESSMENT:
Management of Malocclusion and Skeletal Problems

• Assessments are graded based on the evaluative criteria
• The student must demonstrate NO critical errors

<table>
<thead>
<tr>
<th>Problem List</th>
<th>Treatment Objectives</th>
<th>Treatment Plan</th>
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Clinical Simulation

- Constructed response
- Objective grading criteria
- “Anonymous”
- Controlled conditions
  - Fewer confounding variables
Assessments can...

- Direct instructional targets
- Monitor student achievement
- Monitor instructional effectiveness
- Recognize deficiencies
- Credential competence
Percentage Passing First Assessment: 2008-2009

<table>
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<tr>
<th>Cycle</th>
<th>% Pass</th>
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<tr>
<td>1</td>
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<td>7</td>
<td>75.8</td>
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First Trial Competency Assessment
Average Grades: 2008-2009

Grade conversions: A = 5, A- = 4, B+ = 3, B = 2, F = 1
CLINICAL COMPETENCY ASSESSMENT AND INSTRUCTION

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### Setting and Reaching Targets

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**Orthodontics (25E, 27A, 21C,vi)**

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1. **Accurately Elicit and Record Orthodontic Concerns**

2. **Accurately Recognize and Record Dental/Occlusal Problems**
   - a. Tooth malposition associated with dental or periodontal pathology or dysfunction
   - b. Tooth malposition adjacent to an extraction site that would affect optimal prosthetic treatment
   - c. Tooth malposition related to supra eruption (hyperocclusion)
   - d. Tooth malposition related to trauma
   - e. Impacted teeth
   - f. Developing teeth that are in poor positions and are likely to be impacted
   - g. Missing teeth
   - h. Supernumerary teeth
   - i. Disturbances of dental development and eruption
   - j. Disturbances of tooth eruption: Over retention of primary teeth, premature loss of primary teeth
   - k. Ankylosed teeth
   - l. Tooth malposition related to function [#5]

3. **Accurately Recognize and Record Occlusal Conditions that are Risk Factors for Oral Diseases/Dysfunction**
   - a. Overbite [100%]
   - b. Overjet [Severe]
   - c. Open bite
   - d. Dental Crowding [Severe]
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4. **Accurately Recognize and Record Skeletal Conditions that are Risk Factors for Oral Diseases/Dysfunction**
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5. **Accurately Recognize and Record Functional Conditions that are Risk Factors for Oral Diseases/Dysfunction**
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   - c. Abnormal swallow
   - d. Abnormal breathing
   - e. Bruxism
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6. **Accurately Record an Appropriate Problem List and Treatment Objectives**

7. **Accurately Record an Appropriate Sequential Treatment Plan**

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**Faculty Signature**
Key Enabling (Foundational) Knowledge:

- **Growth and Development**
  - Principles of physical development
  - Prenatal and postnatal growth and development of cranium, jaws, teeth and supporting structures
  - Concepts of variability and timing of growth due to heredity and environment
  - Chronology of dental development
  - Development of occlusion (primary, transitional, adolescent, permanent)
  - Dimensional changes of dental arches
  - Interaction between growth pattern and tooth position
  - Biology of tooth movement
  - Cephalometric evaluation of growth

- **Diagnostics**
  - Space Analysis
  - Tooth size analysis
  - Classification of Malocclusion
  - Etiology of Malocclusion
  - Epidemiology of Malocclusion
  - Cephalometric evaluation of skeletal, soft tissue, and dental relationships
  - Relationship of facial morphology to malocclusion
  - Differentiation of patients with isolated uncomplicated problems from those with more complex problems
  - Recognition of skeletal problems
  - Assessment of panoramic radiographs

- **Treatment Planning Concepts**
  - Limited Orthodontics
  - Comprehensive Orthodontics
  - Growth Modification
  - Orthognathic Surgery
Subskills

• **Reading** diagnostic records
  – Recognizing conditions that require attention, based on *visual inspection*
    • Cephalometric and panoramic radiographs
    • Facial and intra-oral photographs

• Patient evaluation

• Eliciting the concerns of the patient

• Model cast analysis

• Facial/Skeletal Analysis (Cephalometrics)
  – These are taught and support skills that are assessed.
  – The goal of instruction is the **attainment** of generalized competence, i.e. not specific to the unique conditions of the assessment and **set at a level higher than minimal competence**.
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Spiral Curriculum
(Jerome Bruner)

• Content is introduced and revisited in other contexts as students progress to skills often involving higher cognitive domains.
Foundational Knowledge
D1, D2

Formative Experiences
D2, D3

“Competence”
D3, D4
1. Concerns of the patient
   • Evaluative Criteria
   • Clinical evaluations

2. Case Review
   • Skeletal Conditions/Problems
   • Cephalometric Analysis

3. Skill building: Overjet
   • Visual Inspection: Skeletal Conditions/Problems
   • Model Cast Analysis

4. Skill building: Panoramic radiographs
   • Preparing for the assessment
   • Mock assessments/Collected for grading

5. Reviewing mock assessments
   • Question/Answers based on the 17 cases posted on Blackboard site

6. Final assessments
   • 4 clinical case simulations
   • 0 critical errors in 1 or more cases
Failing the assessment is NOT the end!

– Individual coaching/tutorial [30 minutes]
– Additional opportunities without grade penalty
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Challenges

– “Minimal” Competence and credentialing
– Teaching to the test
– Grading
  • Accuracy and Reliability
– Validity
  • Demonstration vs. Attainment
– Instructional Effectiveness
– Student perceptions
- Dr. Charles Bertolami
- Dr. George Cisneros
- Mr. Robin Lipp
- Predoctoral Orthodontic Taskforce
- Dr. Michael Riolo
- Dr. Richard Vogel
Thank you!

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