How Gross Anatomy is Taught to North American Dental Students – Results from the Basic Science Survey Series for Dentistry

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What is the Basic Science Survey Series (BSSS) for Dentistry?

Educational research project (started in 2008) to assess how we are teaching dental students the basic sciences in North American Dental Schools via eight Web-based surveys.

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Recent Landmarks in Dental Education


2) In 2005, formation of ADEA Commission on Change and Innovation (CCI)

3) In 2008, shift from curriculum guidelines to foundational knowledge with the approval of the ADEA Competencies for the New General Dentist by the ADEA House of Delegates.

4) In 2011, the ADEA House of Delegates approved the ADEA Foundation Knowledge and Skills for the New General Dentist.

5) In 2011, ADEA President-Elect, Dr. Gerald N. Glickman, appoints members to serve on the ADEA Task Force for Biomedical Sciences Competencies.
General questions we wanted to assess concerning dental basic science instruction?

1) What are the specific topics and content areas being presented?
2) Who are the faculty teaching these courses?
3) How are the courses being taught?
4) How many student contact hours are needed to teach these courses?
5) How much experience do faculty have teaching the anatomical sciences and teaching dental students?
6) Are the dental students taught with other professional students?
7) Are the dental students taught in a laboratory setting?
8) Do the faculty use computer-assisted instruction (CAI) applications?
9) Has your school undergone curriculum changes which have affected the teaching of the basic sciences?
10) Are we preparing the dental students for their board examinations?
How was Basic Science Survey Series (BSSS) for Dentistry implemented?

Grant sponsored by three American Dental Education Association (ADEA) Sections: 1) Anatomical Sciences, 2) Physiology, Pharmacology, and Therapeutics, and 3) Biochemistry, Nutrition, and Microbiology.

Surveys Completed:

Anatomical Sciences Section:
1) Gross Anatomy
2) Neuroanatomy/Neuroscience published in JDE
3) Histology and Embryology published in JDE

Physiology, Pharmacology, and Therapeutics Section:
4) Physiology accepted by JDE
5) Pharmacology published in JDE

Biochemistry, Nutrition, and Microbiology Section:
6) Biochemistry/Nutrition
7) Microbiology/Immunology
General Goals of the Basic Sciences Survey Series for Dentistry

It is anticipated that the information derived from these surveys will:

1) serve to help guide curricula in dental schools
2) help assist educators in removing irrelevant, archaic information from current curricula
3) aid in including important new information
4) help test construction committees develop examinations based upon generally-accepted, contemporary information
5) provide contact information of course directors of dental basic science courses to facilitate communication between faculty members.
Assessing how dental students are taught the anatomical sciences: Three surveys completed

**Gross Anatomy** – 71 survey respondents representing all 67 of the US and Canadian Schools = 100% response rate

**Neuroanatomy/Neuroscience** – 78 respondents representing 66 of the 67 US and Canadian Schools = 98.5% response rate
  - No response - Université Laval Faculté de Médecine Dentaire

**Histology and Embryology** – 97 respondents representing 60 of the 67 US and Canadian Schools = 89.6% response rate
  - No response - Laval Faculté de Médecine Dentaire, Montreal, Toronto, Harvard, Marquette, Minnesota, Florida, Tennessee
High variability in gross anatomy course content

Observations:
1) 17 (25.4%) dental schools reported their students are taught with other professional students.
2) 13 (19.4%) dental schools reported students take gross anatomy with medical students.
3) Dental students are being taught anatomy that may not be pertinent to their profession or to their board examination preparation due to taking courses with other professional students.
4) Delivery of clinical lectures is substantial.

In Summary:
Most dental anatomy courses cover the superficial back, upper limb (proximal to the elbow), thorax, abdomen, and head and neck, with emphasis on cranial nerves.

<table>
<thead>
<tr>
<th>What topics are covered in your dental anatomy course?</th>
<th>Responses</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional Nerve Components</td>
<td>62/67</td>
<td>92.5</td>
</tr>
<tr>
<td>Autonomic Nervous System</td>
<td>61/67</td>
<td>91.0</td>
</tr>
<tr>
<td>Lymphatics</td>
<td>59/67</td>
<td>88.1</td>
</tr>
<tr>
<td>Arm/Brachium</td>
<td>58/67</td>
<td>86.6</td>
</tr>
<tr>
<td>Spinal Cord/Vertebral Column</td>
<td>58/67</td>
<td>86.6</td>
</tr>
<tr>
<td>Spread of Infection/Fascial Planes</td>
<td>56/67</td>
<td>83.6</td>
</tr>
<tr>
<td>Planes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forearm/Antebrachium</td>
<td>49/67</td>
<td>73.1</td>
</tr>
<tr>
<td>Ear</td>
<td>49/67</td>
<td>73.1</td>
</tr>
<tr>
<td>Local Anesthesia Techniques</td>
<td>48/67</td>
<td>71.6</td>
</tr>
<tr>
<td>Hand</td>
<td>44/67</td>
<td>65.7</td>
</tr>
<tr>
<td>Cranial Nerve Nuclei</td>
<td>44/67</td>
<td>65.7</td>
</tr>
<tr>
<td>Joints (of Upper Limb)</td>
<td>42/67</td>
<td>62.7</td>
</tr>
<tr>
<td>Inguinal Region</td>
<td>38/67</td>
<td>56.7</td>
</tr>
<tr>
<td>Radiological imaging</td>
<td>35/67</td>
<td>52.2</td>
</tr>
<tr>
<td>Cross-Sectional Anatomy</td>
<td>31/67</td>
<td>46.3</td>
</tr>
<tr>
<td>Pelvis</td>
<td>28/67</td>
<td>41.8</td>
</tr>
<tr>
<td>External Genitalia</td>
<td>24/67</td>
<td>35.8</td>
</tr>
<tr>
<td>Deep Back</td>
<td>24/67</td>
<td>35.8</td>
</tr>
<tr>
<td>Perineum</td>
<td>19/67</td>
<td>28.4</td>
</tr>
<tr>
<td>Lower Limb</td>
<td>14/67</td>
<td>20.9</td>
</tr>
</tbody>
</table>
High reliance on medical school faculty to deliver dental gross anatomy instruction

Observations and Questions:
1) Only 39.4% (28) of the 71 faculty surveyed held a primary appointment in a dental school.
2) 59.2% (42) of 71 survey respondents had primary appointment in the medical school.
3) Are the instructors the award-winning teachers or researchers who have no grant funding?
4) Do medical faculty have the knowledge of dental-specific anatomy?
5) Interprofessional education (IPE) is prevalent especially in Canada where medical and dental students are taught together.

Gross Anatomy: In what school is your (faculty member’s) primary departmental affiliation located?

<table>
<thead>
<tr>
<th></th>
<th>Dental</th>
<th>Medical</th>
<th>Allied Health</th>
<th>Subcontracted</th>
</tr>
</thead>
<tbody>
<tr>
<td>28/71</td>
<td>42/71</td>
<td>1/71</td>
<td>1/71</td>
<td>1/71</td>
</tr>
<tr>
<td>39.4%</td>
<td>59.2%</td>
<td>1.4%</td>
<td>1.4%</td>
<td></td>
</tr>
</tbody>
</table>

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High reliance on medical school facilities to deliver anatomical sciences instruction

Observations:
1) 76.1% of dental schools report using medical school facilities during gross anatomy laboratories.
2) Few dental schools have their own laboratory facilities, unless they are a stand-alone dental school (not affiliated with a medical school).
3) Creighton University is the only ‘non-stand-alone’ dental school that continues to maintain a separate gross anatomy laboratory for their students.
4) Many dental schools plan their gross anatomy course around the medical gross anatomy schedules.

Gross Anatomy: Where is your gross anatomy laboratory located

<table>
<thead>
<tr>
<th>Location of Gross Anatomy Facilities</th>
<th>Dental</th>
<th>Medical</th>
<th>Allied Health</th>
<th>No Lab Exists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental</td>
<td>13/67</td>
<td>51/67</td>
<td>1/67</td>
<td>2/67</td>
</tr>
<tr>
<td>Medical</td>
<td>19.4%</td>
<td>76.1%</td>
<td>1.5%</td>
<td>3.0%</td>
</tr>
</tbody>
</table>

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West Virginia University
Interprofessional Education (IPE) – Dental students are often taught anatomy and neuroanatomy with other professional students?

Dental students share instruction with other students in 17 anatomy courses (25.4% of courses).

<table>
<thead>
<tr>
<th>Do dental students take these courses with other students?</th>
<th>Responses</th>
<th>Percentage of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical students</td>
<td>13/67</td>
<td>16.5%</td>
</tr>
<tr>
<td>Allied Health Students</td>
<td>2/67</td>
<td>3.0%</td>
</tr>
<tr>
<td>Graduate Students</td>
<td>2/67</td>
<td>3.0%</td>
</tr>
</tbody>
</table>

Observations:
1) 13 (19.4%) dental schools report students take gross anatomy with medical students.
2) Dental students are being taught anatomy is not be pertinent to their profession.
3) Scheduling of the gross anatomy laboratory is difficult, altering time of instruction.

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Results of four dental survey studies show a trend toward decreasing student contact hours in gross anatomy.

Observations:
1) The last published paper discussing survey results from dental gross anatomy courses was in 1984.
2) Decrease in contact hours more substantial in gross anatomy.

References
1. Summers RG, Jones KH, Jones PH. 1984. Study of Courses in Gross Anatomy for Dental Students in the United States and Canada. Published by SUNY-Buffalo.

Gross Anatomy: How many total student contact hours are allocated for dental gross anatomy?

<table>
<thead>
<tr>
<th></th>
<th>Average student hours</th>
<th>Range (in hours)</th>
<th>Number of schools reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984 study¹</td>
<td>162</td>
<td>64-352</td>
<td>63</td>
</tr>
<tr>
<td>1991 study²</td>
<td>156</td>
<td>55-280</td>
<td>36</td>
</tr>
<tr>
<td>1996 study³</td>
<td>142</td>
<td>60-306</td>
<td>33</td>
</tr>
<tr>
<td>Current study</td>
<td>134</td>
<td>50-239</td>
<td>62</td>
</tr>
</tbody>
</table>

Curriculum Changes: 35 (52.2%) dental schools reported a curriculum change in the last five years. Contact hours were cut in 60% of gross anatomy courses.

<table>
<thead>
<tr>
<th>Change in contact hours</th>
<th>Schools reporting: Gross Anatomy</th>
<th>Percentage: Gross Anatomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease</td>
<td>21/35</td>
<td>60.0%</td>
</tr>
<tr>
<td>Increase</td>
<td>4/35</td>
<td>11.4%</td>
</tr>
<tr>
<td>No effect</td>
<td>10/35</td>
<td>28.6%</td>
</tr>
</tbody>
</table>

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“Seasoned” Dental Anatomy Faculty (in years)

<table>
<thead>
<tr>
<th>Faculty Experience</th>
<th>Mean (in years)</th>
<th>Median (in years)</th>
<th>Range (in years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Anatomy</td>
<td>23.2</td>
<td>25</td>
<td>2 - 50</td>
</tr>
</tbody>
</table>

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Many institutions have implemented computer-assisted instructed (CAI) applications

Observations:

1) 59.7% (or 42) of 67 dental schools use CAI tools to implement gross anatomy instruction.
2) High utilization of CAI tools may be due to the loss of student contact hours.
3) Better definition for CAI tools was needed on later surveys.
4) Online dissection manuals, online assessments, cranial nerve testing, etc.

Does your course use any type of CAI applications to engage the students?

Anatomy

- Yes
- No
- No response

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### Use of Computer-Assisted Instruction (CAI) Tools within the Anatomical Sciences

<table>
<thead>
<tr>
<th>Course</th>
<th>Schools using CAI tools</th>
<th>Percentage of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>neuroscience</td>
<td>31/65</td>
<td>47.7%</td>
</tr>
<tr>
<td>anatomy</td>
<td>42/67</td>
<td>60.6%</td>
</tr>
<tr>
<td>histology and embryology</td>
<td>47/56</td>
<td>83.9%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>120/188</strong></td>
<td><strong>63.8%</strong></td>
</tr>
</tbody>
</table>

Histology leads usage of CAI tools - virtual microscopy!
Embryology - short videos (Symbro & Embryo Images)
Anatomy – online dissectors and atlases
Neuroscience – interactive brain atlases
Most dental anatomy courses have computers located within their dissection facilities enabling the use of CAI tools, such as online atlases & dissectors. Examples of CAI tools utilized included: 1) using online content in a course management system; 2) assigning students to view external websites, such as MedEdPortal® content; 3) viewing dissection videos (in-house or commercial, Acland’s Atlas); 4) using online atlases and dissectors.

Mentioned in survey: VH Dissector Pro, Acland’s Videos, Netter’s Atlas, Primal Pictures.
Summary of Dental Anatomy Survey Results

- Great variability exists in the delivery of content in dental anatomical sciences courses
- 60.6% of 71 survey respondents reported their primary appointment is outside of the dental school
- 76.1% of gross anatomy laboratories located within a medical school
- 71 faculty reported an average of 23.2 years of experience in teaching the anatomical sciences
- Delivery of clinical lectures has increased
- 21 institutions saw a recent decrease in student contact hours in gross anatomy
- 59.7% of schools use CAI applications to teach gross anatomy
- 2 institutions (UNLV and Montreal) do not utilize a formal gross anatomy laboratory, rather they rely on models and images
E-mail me if you have questions?

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