LOMA LINDA UNIVERSITY
MEDICAL CENTER
Staff Development

Faculty Development Showcase Week:

Mentoring Dental Faculty in Evidence Based Research

Course Description:
Clinical Faculty are limited in time and resources for conducting research in their respective disciplines. The Clinical Faculty EBD Mentoring Program is being conducted at this time as a pilot program in LLU School of Dentistry. This program provides clinical faculty the opportunity to conduct evidence-based research supported by research mentor, research assistants, and statistician. At this time, six faculty members are participating and supported with six research assistants. The program is conceptually a framework of projects that fit within an umbrella project, Evidence-based Research and Practice System. This system is part of the emerging field of healthcare intelligence that validates confidence in evidence that may be used in shared-decision making when personal health care plans are being developed. Unlike business intelligence, healthcare intelligence is dependent on evidence-based principles to provide the foundation from which to continuously reassess health knowledge and perform scientific rigor for robust systems. This showcase presents faculty research projects that build on this foundation. These presentations include: Sepsis of Oral Origin, PI: Sue Spackman; Knowledge, Critical Thinking Skills, and Attitudes using systematic review, PI: Samah Omar; Dental Dam Clinical Outcomes, PI: Holli Riter; Theory of Dental Occlusion, PI: Parnell Taylor, and Understanding the Best Estimate, PI: Robert Fritz.

Course Objectives:
The participant will:

1. Describe the Clinical Faculty EBD Mentoring Program
2. Discuss projects of participating clinical researchers

CLINICAL FACULTY EBD* MENTORING PROJECT

*EVIDENCED-BASED DENTISTRY

PROBLEM

- Clinical Faculty are required by program requirements to dedicate much of their time to teaching and practice within the general or specialty clinics of the LLU School of Dentistry, extended LLU clinic venues, Faculty Dental Practice, or some combination of all. While their appointment to the University is disproportionally committed to performing these duties and responsibilities, their advancements are predicated on a portfolio of research as well as other creative activities. Most Clinical Faculty have not completed formal time in research methodology or find insufficient time during normal working hours for creative activities. This problem is not a phenomenon of Faculty at LLU professional schools but of many professional schools throughout the US, a fact reported in the literature, and results in (just to name a few):
  - Lack of understanding on part of Administration causing disillusionment and delayed advancement
  - Publications limited to procedure and case reporting
  - Inability to develop a line of research
  - Extended time for completing projects and publications

OPPORTUNITY COSTS

- Most importantly, there is a loss of opportunity to the profession of Clinical Faculty creative, innovative ideas from clinical practice because of these aforementioned barriers.
  - Loss of Access: Cannot tap or canvas creative ideas or interests to enlighten other professionals.
  - Loss of channeling (pipeline) of clinician identification of problems to new knowledge. In other words, loss of clinician process (deductive reasoning) in difference to research process (inductive reasoning).
  - Loss of clinician to clinician communication of ideas for collaboration.
  - Loss contributions to the professional literature.
  - Loss of new lines of discovery and research
  - Loss of recognition and confirmation of the clinician contributions to new knowledge creation and relevance that this new knowledge has to the profession. Investigative questions impacting society are generated from clinical practice not basic research in of itself.

MENTORING PROJECT

Project was developed and is being piloted to assist Clinical Faculty in developing a line of research, first in evidence-based dentistry, then leading to original research. In this manner, a foundation of previous knowledge defining a subject of interest and providing insight as to known variables and findings. From this foundation, theories or hypotheses building may be made for further research. The Research Advisor manages the project. Research assistants perform all research tasks. Meetings are held weekly between Research Advisor and assistants to monitor progress. Formal meetings are held for Clinical Faculty when critical appraisal of progress is needed. OneNote workbooks are developed for each project in which project assigned research assistants input findings of research tasks that may be reviewed by all.

EVIDENCE-BASED PRACTICE AND RESEARCH SYSTEM

Knowledge gained from evidence-based research are being incorporated into a graph database for query by clinicians in practice in generating clinical practice guidelines with cost-effectiveness and benefit trade-off options.

OUTCOMES

- Clinical Faculty develop individual lines of research from which research portfolios are established.
- Research may be reported
  - Abstract presentation
  - Professional presentations
  - Manuscripts for publication
- Students from surrounding colleges and universities interested in careers in healthcare or other client-provider disciplines may participate in research
- Graph database is established to produce LLUSOD-based, clinical practice guidelines for use in asking clinical questions.
- Fosters a more advanced EBD program at LLUSOD.

PROGRAM DIRECTOR

Janet G Bauer, DDS, MSEd, MSPH, MBA

Research Mentor

PROGRAM STAFF

Udo Oyoyo, PhD – Statistician

Research assistants:

Amanjyot Bains, BDS – Lead Research Assistant

Student Research Assistants – California State University at San Bernardino

PROJECTS

- Riter, Holli
  - Studying dental dam outcomes using graph database principles
  - Research assistants
    - Joshua Dimapilis
    - Thalia Milian
- Taylor, L Parnell (Presenter)
  - Theory of Dental Occlusion
  - Research assistants
    - Raquel Lomeli (Presenter)
    - Christopher Phillips (Presenter)
- Omar, Samah
  - Assessing knowledge and attitudes in systematic review using KACE instrument
  - Co-Investigators
    - Afsaneh Matin (Presenter)
    - Jung-Wei Chen
  - Research Assistant – Amanjyot Bains
- Spackman, Sue (Presenter)
  - Dental student perceptions of older adults in geriatric dentistry curriculum
  - Research assistant – Amanyjot Bains
- Fritz, Robert (Presenter)
  - Best Estimate: Quantification of Margins and Uncertainty
  - Research assistant - Jeanette Jetton-Rangel (Presenter)
- Spackman, Sue
  - Mapping sepsis of oral origin
  - Research assistant – Amanjyot Bains (Presenter)

RITER GROUP

Studying dental dam outcomes using graph database principles

Presented by:

PI: Holli Riter, DDS

Co-investigator: Janet Bauer DDS

Research assistants:

Joshua Dimapolis

Thalia Milian

Introduction

Dental dam was invented by Sanford Barnum and popularized in the 1860's for use in surgical dentistry. Today, dental dam is made from latex and non-latex rubber, whose disposable is required after each use. Dental dam is a tool, a part of a dental armamentarium used to achieve the goals of:

- Safety – Shield
  - Preserve the physical presence and function of adjacent anatomical structures to the surgical site
  - Prevent damage to intra-oral structures from and swallowing of surgical projectiles.
  - Prevent incidental iatrogenic surgical error
- Moisture control – Quality assurance of dental material properties in impacting positive outcomes of the subsequent repair or rehabilitation of teeth.
- Efficient isolation of the surgical site
  - Visualization, accessibility, and facilitate surgical procedures of infection or rehabilitation site
  - Controlling the spread of infection
    - From teeth to host
    - Host to host

The purpose of this study is to map clinical patterns and outcomes for use of the dental dam in implementing new technology, graph databases, and mapping clinical practice guidelines in decision-making.

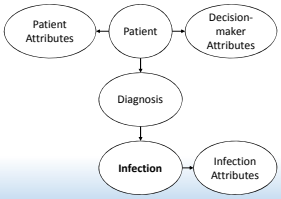
PURPOSE

This study was conducted using a systematic review of the literature to discover evidence related to the goals of the use of the dental dam: safety, moisture control, and efficient isolation of the surgical site. The search bibliome included citations found using PubMed, Google, EBSCOhost, and Science Direct. A total of 50 papers including 2 case studies were obtained, reviewed, and analyzed. Patterns and outcomes were mapped using Neo4j graph database principles. A traversal graph of patterns and outcomes achieved Subject Matter Expert level of knowledge of node to node relationships with edge-probabilities to each reported outcome terminus. Data points were averaged due to the limited amount of data available. The parametric Shapiro-Wilks at p=.05 significance level was used to quantify the result.

METHOD

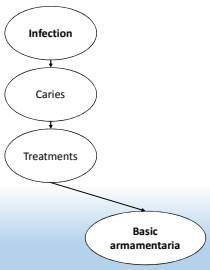
Results

The graph stores data about a subject of interest, in this case Dental Dam. The utility of this stored data is used to query the database for information useful in making a clinical decision. The map begins with a Patient record or conceptual patient node due to compilation of data points rather than single data points as would occur in an actual patient traversing the graph database. The primary nodes are presented here.



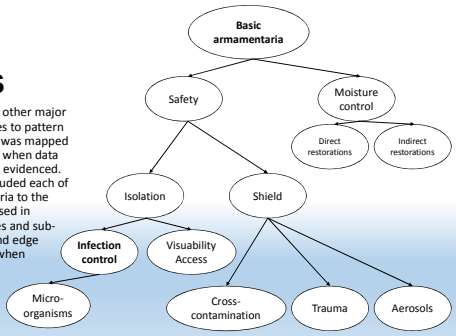
Results

From the primary node to node relationships, the graph traverses to the subject of interest nodes: Caries, Treatment with Attribute node, Basic Armamentarium.



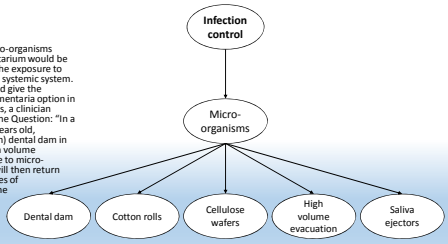
Results

Graph then brakes into other major and their children nodes to pattern outcome termini. Each was mapped with edge probabilities when data from the literature was evidenced. Mapped outcomes included each of alternative armamentaria to the dental dam currently used in practice. In all, 61 nodes and sub-nodes were mapped and edge probabilities inputted when evidenced.



Results

For example, the node Micro-organisms would map what armamentarium would be most effective in reducing the exposure to the patient, or the patient's systemic system. The edge probabilities would give the effectiveness of each armamentaria option in reducing this exposure. Thus, a clinician querying the database for the Question: "In a diabetic patient who is 40 years old, diagnosis of HIV, will (option) dental dam in comparison to (option) high volume evacuation reduce exposure to micro-organisms." The database will then return the comparative probabilities of effectiveness for deciding the best option to use in this case.



Conclusions

Mapping of the clinical patterns and outcomes produced a computational model at a Subject Matter Expert level of knowledge regarding the dental dam. With this model and further research using systematic review and existing database resources, we will be able to increase our predictive knowledge of the outcomes of the use of the dental dam for surgical dentistry along with validating the model.

TAYLOR GROUP

Dental Occlusion

Presented by:
PI: Parnell Taylor, DDS
Chris Phillips
Raquel Lomeli

Co-Investigator: Janet Bauer, DDS
Research assistant: Amanjyot Bains, BDS

Introduction

Occlusal determinants were initially formulated and developed for non-dentate patients who required complete prosthetic rehabilitation of the mandibular and maxillary jaws. Between the 1910s and 1960s, these determinants were refined and applied to dentate patients requiring fixed prosthodontic restoration or rehabilitation of the natural dentition. Presently, dental occlusion has been defined by determinants of inter-cuspal contact relationships and the function of closure. However, validation of these determinants have not been supported by epistemological concepts only observation.

The purpose of this line of investigation is to validate a theory of dental occlusion: Theory is stated - Dental occlusion is the most antero-superior location of the mandibular condyle situated in the mandibular (glenoid) fossa that satisfies the equation centric relation is equivalent to centric occlusion is equivalent to maximum inter-cuspal position (CR=CO=MIP). When this formula is satisfied, little to no occlusal wear is evidenced from functions of closure or chewing.

PURPOSE

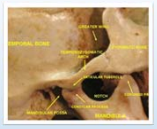
Dental Occlusion

- *Centric relation (CR)
- *Centric occlusion (CO)
- *Maximum inter-cuspal position (MIP)

Concepts

Centric relation

Centric relation is the most antero-superior positioning of the condyles within the mandibular (glenoid) fossa against the thinnest avascular portion of the articular disc.

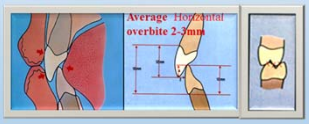


Centric occlusion

Centric occlusion is the first occlusal contact occurring while the condyles are in centric relation.

MIP

Maximal intercuspation (MIP) is the cusps of the teeth of both arches fully interposing themselves with the cusps of the teeth of the opposing arch.



Outcome

Little to no occlusal wear evidenced in the adult dentition.

The first phase of this line of investigation is to study centric relation, the mandibular fossa, temporomandibular joint and its anatomical and biological structures. A bibliome of 137 references were retrieved and reviewed for content. Timelines of cellular, anatomical, and biological structures was developed to establish study variables to conceptualize centric relation.

METHOD

Two timelines, while continuous, were distinct in their approaches to centric relation. First timeline chronicled animal development of the Temporomandibular Joint space (Temporal fossa) appearing over 2.5 million years ago. The variables most important in predicting evolutionary and anatomical changes in modern humans (appearing over 250,000 years ago).

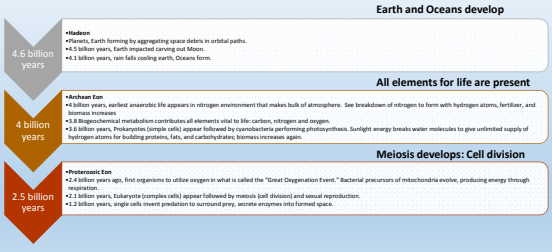
Results

First Timeline

Presented by

Christopher Phillips

Timeline in context



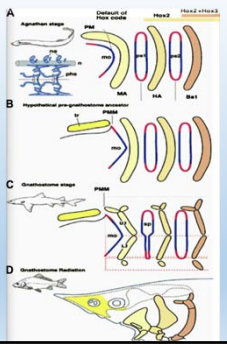
Environment

Innovations: From single cell animals to complex animals

Cartilage, Gills, Bone, Teeth

Major innovation Pre-cursor to Mandibular Jaw

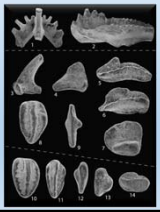
Figure to right shows the enlargement of the first gill arch, managed by D1x homeobox genes, to form a lower jaw



Into the Cambrian Explosion

Multicellular animals whose many cells take on the structure of organs having specialized tasks or function.

- 600 million years, multicellularity appears in which dividing cells bond and associate together; These are Ediacarans whose innovations include cells specializing in different tasks and emergent structures appearing. Thus, simple animals, Urmetazoan hypothesized as the last common ancestor of all animals, appear possessing nerves, brains, muscles, eyes and internal organs. **Gills were formed and used both for feeding and breathing.** These animals are considered the link between vertebrates and invertebrates.
- 550 million years, Cambrian explosion when most modern phyla of animals begin to appear.
- 505 million years, Ostracoderms (Chordates: Agnatha) were the first fish to use **gills exclusively for breathing.** They were the first vertebrates; they were armored but jawless fish, called "round mouths," having to constantly cycle water due to the lack of a jaws (**buccal pump**).
- These were the earliest creatures to have bony heads, large solid dorsal and ventral head shield. This bony skull consisted of the same structure as teeth (**dermal armor**), a layer of enamel and a layer of pulp, fused together. These **teeth-like structures appear in Conodonts (495 million years) and were used for grasping and crushing.**



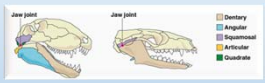
True teeth evolved through the extension of dental armor from the external dermis to internal epithelium soon after the origin of jaws. Thus, dermal teeth were hard structures found on the external surfaces of animals or near internal openings. Dermal teeth were composed of soft pulp surrounded by dentine and covered by a mineralized substances such as enamel.

True Teeth

Placoderm

Major innovation: Appearance of Mandibular Jaw as Dentary bone (plate)

Primitive mandibular jaw was composed of many plates that later would fuse to form one plate, Dentary bone (mandibular jaw)



Primitive jaw Mammalian jaw

Results-First timeline…

542 million years

- **Phanerozoic Eon**, called the "period of well-displayed life," subdivided into the Paleozoic, Mesozoic, and Cenozoic eras.
- **Paleozoic era**
  - 535 million years, chordates appear branching into two species invertebrates and vertebrates or fish. **This is resulted in the enlargement of the first gill arch, managed by D1x homeobox genes, to form a lower jaw. This modification into a mandibular jaw gave vertebrate fish the ability to grasp and take in larger prey.** Jaws allowed vertebrates to reach much larger sizes and dominant and replace jawless forms. With the buccal (muscular) pump mechanism in Ostracoderms, the mouth grew wider and bigger; it also became stronger and tougher; this paved the way for the transformation into real jaws.

480 million years

- **Placoderm** (Craniata: Gnathostomata) were some of the first jawed fishes. Their head and thorax were covered by articulated armored plates. Their jaws contained true teeth, a **dentary bony** mandibular arch that articulated. Placoderms show a rudimentary synovial joint.

390 million years ago, lungfishes precursor to the Tetrapods, developed primitive synovial joints, found only in the jaws.

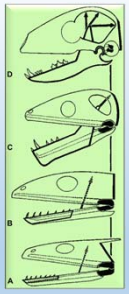
Innovation: Synovial joint

Synovial joints are freely mobile joints where ligaments generally connect the bones. These joints contain synovial fluid in a space (joint cavity) between the bones that helps create a cushion and smooth movement. Synovial joints contain:

*Socket
*Meniscus-crescent, increasing the size of articular surfaces
*Meniscus of fibrocartilage allowing the potential of the TMJ to have movements in several directions on an xyz axis.

Concurrent innovation: Cartilaginous joints

Synovial, hinged joint – Temporomanidibular joint (TMJ)



Large pressures exerted on the bones might then bring the cartilage-covered ends into contact, in conjunction with a developing system of lubrication. These are **hinged joints with gliding (one surface over another) and angulation (extension, flexion, roll)**

Tetrapods

Next innovation: Transition of ocean dwellers to land dwellers

Reduction in size and number of bones

410 million years

•Devonian era
•Proliferation of land plants contributed to the increase of oxygen in the atmosphere. This was the precursor to animals from the ocean to colonize land.
•The Elpistostegalians lived in shallow waters which had less oxygen than the ocean. The lack of oxygen in the shallow waters caused these animals to develop modified swim bladder which acted as lungs. The modified swim bladder allowed the epistostegalians to use atmospheric oxygen to help with cellular respiration. Around 390 million years, fresh water lobe-finned fish (Sarcopterygii) developed adaptations of fins with fleshy bases and bones to navigate these shallow waters. These tetra-pod fishes used their fins as paddles.

- Early tetrapods did not develop on land but instead in shallow waters where there was a wider selection of food sources. While their innovation was proto-lungs and proto-limbs, they showed **no modifications to their skull or jaw**. This disallowed land prey as food sources.
- Tetrapods would eat in water where the hydrodynamic forces from expanding buccal walls of the oral cavity would force food into the esophagus.
- The actual transition from water to land is theorized to have occurred because of the strengthening of the head and jaws. This, then, allowed for **less dependency on water hydrodynamics and led to the dietary inclusion of land prey.**
- **Synovial joints** come into their own with potential of independent mandibular jaw.

Results-First timeline…

256 million years

300 million years

365 million years

Mammals (Synapsids)

Reptiles (Amniotes)

Amphibians

Sharp teeth
Innovation:
Keratin (claws)

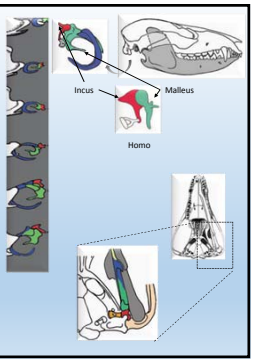
No major innovations during this period of change

Pre-cursor Tempromandibular joint

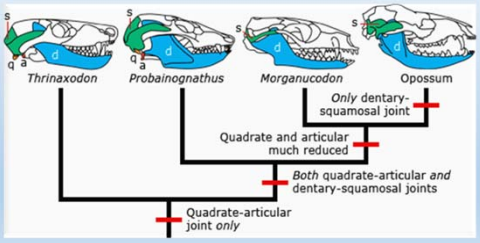
Innovation: Glenoid fossa
Development of the temporal fossa
(Temporomandibular joint)

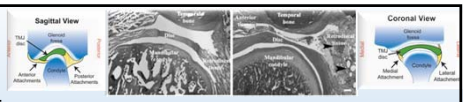
Synapsids

- From the Tetrapods came the Synapsids. **The Synapsid innovation was the development of the mandibular fossa** (glenoid fossa of the temporal bone).
- The joint of the early Synapsid was composed of the squamosal, quadrate, articular, and dentary bones. An elongation of the sutures uniting different bones, progressively led to their separation and transversal orientation. The squamosal bone became located along the quadrate in the skull and the dentary with the articular.
- It is then believed that the articular and quadrate bones moved into the middle ear region to form the malleus and incus.
- The loss of the quadrate-articular bones is what separates the tetrapods from the early mammals, now having developed a dentary-squamosal formed fossa.



Summary of development of the mammalian fossa showing bone separation and orientation





*Mandibular jaw
*Synovial joint
*Hinged joint: gliding and angulation movements (degrees of freedom, xyz axes)
*Temporomandibular joint with movement in potentially independent directions
*Articulation of teeth
*Loading pressure: 2500 to 6000 psi (context: human is 120 psi)

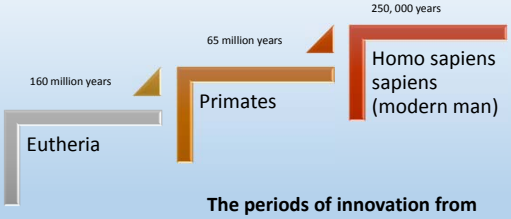
Summary: Innovations of the first time-line of evolution of centric relation

2nd Timeline

Presented by
Raquel Lomeli

Innovation: Adaptation to environment

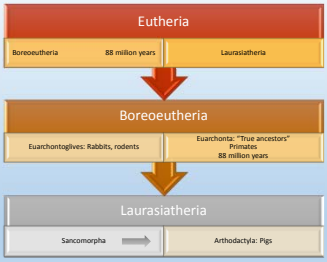
Results: Second timeline…



The periods of innovation from Class Eutheria to Class Homo sapiens sapiens, or Modern Man

Eutheria Tree (Partial)

Eutherians are of the Class Mammalia. Eutherians are important to centric relation because **Superorders of these animals are used to study the Temporomandibular joint.** Specifically, these animals include: Rabbits, rodents, primates, pigs, and cattle. There is one area which remains a problem and that is function. Muscles, movements, and joint loads are very species-dependent.



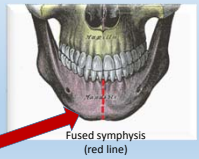


Primate: Plesiadapis innovation was side placement of the eyes limiting their habitat to the ground. Because they could only reach the lower branches of trees, their **diets changed to fruits and leaves**. Previous Euarchontas were small animals feasting on insects.

Adaptation



Primate: Haplorrhini innovation was eyes forward. This trend is linked to an increasing reliance on vision and a decreasing reliance on smell. **The lower halves of haplorhine lower jaws are fused together (fused symphysis).** The incisors are spatulate or shovel-like. There is a space - a diastema - between the upper lateral incisor and the upper canine tooth. The size of the molar teeth increases towards the back of the mouth. Most importantly, Haplorrhini metabolism lost their ability to produce Vitamin C, thus fruit became a major food source to compensate.



Adaptation

Both condyles must work in unison

Eutherian importance in studying human centric relation: **Animal Models**

Sheep, goats, cattle

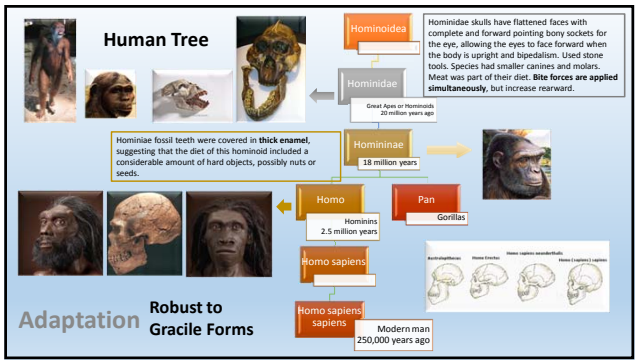
- Sheep, goats and cattle are closely related ruminant artiodactyls and have essentially identical TMJs. This group of ungulates has a distinctive jaw apparatus specialized for an herbivorous diet. The condyle is concave. The TMJs are specialized for great mobility in the transverse plane. **Muscle activity patterns and loading of facial bones are studied for establishing determinants for the human jaw.**

Pigs

- Moderate movements in all planes are permitted and The condyle is compressed and probably twisted during chewing, whereas the lateral surface of the temporal bone is bent. **More general features of pig oral behavior and muscle contraction are known as well. All these are similar to that of higher primates.**

Rabbits, rodents

Masticatory function in rabbits are used to determine calculations of TMJ loads based on muscle activity. In rabbits, the working side condyle may be completely unloaded during the power stroke of chewing.
In rats (and mice), the TMJ is highly specialized for extensive protrusive movements, much more so than the rabbit. The rounded condyle travels in a trough-like temporal fossa and the power stroke is in the protrusive direction with only a minor medial component. However, long-axis rotation can occur around a mobile symphysis (fused in human mandibles).



Homo sapiens Adaptation

- Evolutionary cascade: Change in the shape of the head and jaws.
- The discovery of a mutation, MYH16 gene, which rendered inactive muscles produced for some jaw muscles for chewing and biting.
- Gracile human jaw in contrast to the protruding jaw and facial ridges (robust form). A mandibular jaw that was smaller, forming a triangularly shaped chin, and longer faces with sides parallel.
- Researchers suggest that this difference in muscle structure was part of other changes, dietary among them. These changes were already in progress and contributed to the traits in the human jaw that separated it from the jaw of hominin predecessors.

Conclusions

*In the first phase of centric relation evolution, structural innovations gave rise to the eventual human jaw. The second phase, dietary changes superseded structural changes that eventually gave rise to the human jaw and its teeth.

*Maxillary teeth articulated with mandibular teeth; some evidence indicating this articulation was simultaneous.

*Several mutations led to the inclusion of fruit as a major food source due to the lack of intrinsic production of Vitamin C. Other mutations, MYH16 gene, also rendered inactive some jaw muscles for chewing and biting. These changes produced longer faces, smaller jaws, and triangularly shaped chins. All these made them distinct from predecessors to Homo sapien. Thus, robust attributes delined and more gracile attributes dominated.

*Study of centric relation uses animal models that may mimic neuromuscular activity; protrusive, superior-posterior, and rotational movements; along with loading pressure.

OMAR GROUP

Accessing knowledge and attitudes in systematic review using KACE instrument

Presented by:

Afsaneh Matin, DDS

PI: Samah Omar, BDS, DDS, MSD

Co-Investigors: Janet Bauer, DDS, MSEd, MSPH, MBA

Jung-Wei Chen, DDS

Research assistant: Aman Bain, BDS

Introduction

Journal Clubs in pediatric residency programs are integral to dental education and decision-making. Journal Clubs typically provide residents with a portfolio of articles relevant to their discipline and discuss findings. The goals of the LLU Pediatric Dentistry Journal Club is to promote critical thinking, apply EBD principles to assessing Pediatric Dentistry proessional literature, and improve pedagogic outcomes. Accrediting agencies have encouraged incorporating evidence-based research for systematic review of articles to assess research quality as well as findings. While this implementation is on-going, few have studied the knowledge and attitudes of pediatric residents toward evidence-based dentistry and systematic review.

The purpose of this pilot study is measure the outcome of EBD training by assessing pediatric dentistry residents' knowledge and attitudes in performing systematic reviews.

PURPOSE

The study sample consisted of 7 subjects: 4 first-year residents, who had no prior exposure to research or EBD within the program, and 4 second-year residents, who had, prior to the study, lectures in research design along with a 4 hour presentation in EBD. Preservation of knowledge (correct answers) and attitudes were assessed using Knowledge, Attitude, Access, and Confidence Evaluation (KACE) instrument for the time periods: Pre-assessment to post training (existing knowledge), post training to 6-months (training knowledge), and pre-assessment to 6-months (existing knowledge). The non-parametric Fisher's exact test was used to evaluate knowledge data and Friedman's test to evaluate attitude data. KACE is a standardized assessment instrument previously validated to measure knowledge and attitudes toward systematic reviews.

METHOD

Null Hypotheses

- There is no difference in pediatric residents' knowledge and attitudes toward systematic reviews between pre-assessment, post-assessment, and 6-months post-assessment.
- There is no difference between first and second-year pediatric residents regarding their attitudes toward EBD.

Significant differences between time periods were found in knowledge and attitudes as well as between first-year and second-year residents.

Results

Results-Knowledge

A 4-hour introductory lecture in EBD did not increase knowledge. Existing knowledge was preserved. However, existing and training knowledge declined considerably in the following 6 months (p=.05).

Correct answers were preserved at 73% from pre-assessment to post-lecture indicating that training did re-enforce existing knowledge in evidence-based dentistry but with some decrement. This decrement resulted in a decrease of correct answers by 27%. Six months following post training and pre-assessment, decrements in correct answers were observed. As a result, existing knowledge decreased at a rate of 54%, but stayed higher in preservation of correct answers than the decrement following training knowledge (48%).

Consistency rate of answers

Result	Pre-assessment	Post-assessment	6-months assessment
Consistency of correct answers	**73% (19/26)**	**48% (12/25)**	**54% (14/26)**
Consistency of incorrect answers	86% (38/44)	80% (36/45)	84% (37/44)
Change of correct answers to incorrect answers	27% (7/25)	52% (14/25)	46% (12/26)
Change of incorrect to correct answers (reversals)	14% (6/44)	20% (9/45)	16% (7/44)

Results-Knowledge

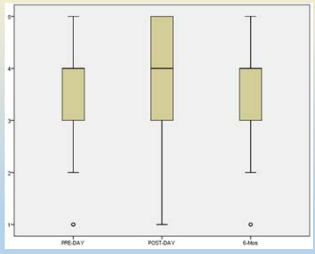
First and second-year residents had similar, low rates of preservation of correct answers for existing knowledge and training knowledge. Existing knowledge decrease at a higher rate for first-year students than second-year students. Training knowledge was preserved but comprehension was low (p=.05).

Comparison of consistency rate between first and second-year residents

Year	Pre-assessment	Post-assessment	6-months assessment
First	32% (13/40	32% (13/40)	28% (11/40)
Second	43% (13/30	40% (12/30)	33% (10/30)

Results-Attitudes

Attitudes were positive, median of 4 on a scale of 1-5 (most positive) with regard to the value of EBD in practice (p=.05). First-year residents demonstrated higher positive attitudes post training than second-years. At 6-months, however, these attitudes returned to match second-year attitudes which were rated consistently positive across the time periods. Success of post training showed changes in attitude with positive ratings increasing to 60% post training, a decrease in those equipoised, 8%, and an increase in negative ratings by 11%.



Conclusions

Using KACE, existing and training knowledge demonstrated high retention rates immediately post training. At 6-months, however, these rates declined with low comprhension. Attitudes, however, were consistently positive to the value of EBD in practice.

FRITZ GROUP

Best Estimate: Quantification of Margins and Uncertainty

Presented by:
PI: Robert Fritz, DD
Jeanette Jetton-Rangel

Co-Investigator: Janet Bauer, DDS

Introduction

One goal of evidence-based dentistry is to provide clinicians and patients with best evidence, or best estimates of intervention outcomes that are directed to uncertainties in decision-making when developing personal oral healthcare plans. Best estimates are usually focused on decision data and are augmented with clinician expertise and experience within informed consent. However, a common complaint of clinicians is that best estimates are often, out of necessity, from a context of less than quality evidence or needing more evidence to provide accuracy.

The purpose of this study is to understand best estimate behavior such that clinicians and patients may have confidence in its quantification and validation in decision-making.

PURPOSE

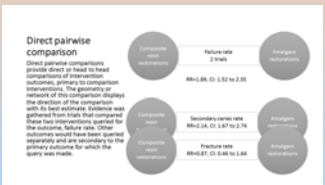
In evidence-based research (EBR), a best estimate is a quantification of many observable events, but not all events, of an outcome regarding a subject of interest, along with quantification of that portion of unknown knowledge explainable as uncertainty or error in measurement. Thus, knowledge about a subject of interest is based on observation (epidemiological knowlege), not deductive reasoning of cause and effect (epistemological knowledge). In stochastic environments, we are not able to observe all events in all situations to know without uncertainty a subject of interest and its predictable outcomes. To discover best estimates and quantify uncertainty, critical appraisals of the literature, gray literature and its resources, or both are accomplished using individual, primary source articles and systematic reviews of systematic review of a compilation of other systematic reviews. Thus, best estimates of outcomes focus on evidence-centered care; it is all about the evidence and decision-making, not engaging providers or patients. This engagement comes later in the whole dynamic of understanding a clinical practice guideline.

METHOD

The Evidence in determining the Best Estimate

Results-Direct pairwise comparisons

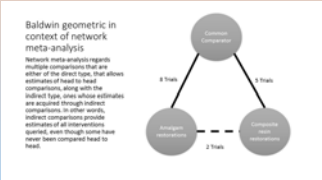
Best estimates come from studies that use pairwise comparisons. Pairwise comparisons are calculated using meta-analytic methods. If multiple comparisons are needed then evidence has to be found that includes all the comparison options. Multiple comparisons use network meta-analysis to calculate best estimates.



The Evidence in determining the Best Estimate

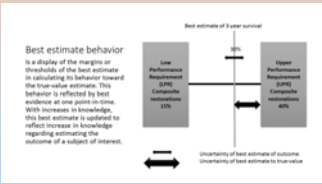
Results-Network meta-analysis

Network meta-analysis (NMA) brings together estimates of outcomes reported using direct comparisons and combines them with estimates of outcomes reported as indirect comparisons. This is done by using comparator estimates whose relationships are pictorially displayed as a network. The outcome of these relationships is to compare every pairwise comparison that is possible within a then developed network. A unified analysis is performed to determine the best estimate of all pairwise analyses.



Results-Reducible uncertainty

How do evidence-based researchers know when best estimates of outcomes are close to true-value? For example, we are looking at composite restorative materials to develop clinical practice guidelines for expected performance using a point-in-time analysis. There may be several points in time that we would want to look at for different reasons: At placement to provide clinicians with estimates as to procedural competence, at subsequent restorative performance over a given duration, and up to and when failure of the restoration is expected. Thus, dentist may wish to know how the best estimate is behaving given the Lower Performance Requirement (or complete failure) and the Upper Performance Requirement (or the highest performance at which the subject of interest can reach).



Quantification of Margins and Uncertainty of the best estimate

Presented by:
Jeanette

How do we explain these Margins (LPR and UPR)?

- First, we ask Manufacturers or Dentists what is their estimate of the LPR, or restoration disintegration, and the estimate of the UPR, or restoration's highest expectation of function. We compile this data and use Shaprio-Wilks (W) statistic to determine the distribution of an average estimate for each end-point. From this distribution, we now have a best estimate for each end-point, its mean and standard deviation.
- Second, we wish to determine what is the true value of this best estimate for each end-point. From the W statistics, we are also given the population variance, SE or standard error, from which we can determine how close the best estimate is to the true value (μ of the population distribution).
- Third, Cochrane Reviews may give the dentist a best estimate (derived from a systematic review) that we can now determine if it overlaps the distribution of the LPR or UPR or is somewhere in-between.
- Also, we can also calculate a QMU value, or a value that quantifies each margin and variance of its distribution to establish one measure that can be used to compare other QMU to see their equitability or distance from other QMUs.
- In the following sides, I will explain this process such that I am taking a reported best estimate and determining if I can have confidence that it is part of the UPR distribution (restoration functioning at its highest expectation), LPR distribution (restoration disintegration), or somewhere in-between.
- I also can determine if the best estimate is approaching the true value of either the UPR or LPR.

Results- Quantification of margins and uncertainty

Point-in-time analysis of QMU (REF) is based on the calculation of a k-factor that is defined as margin divided by uncertainty in a study population regarding an outcome metric, or comparator characteristic of the interventions. Thus, the k-factor is the population mean (μ) minus LPR divided by the population variance.

Since researchers estimate the population mean from study samples, the estimate of the k-factor is the mean of study samples (x) minus LPR divided by standard deviation (s) of the study samples. These study samples are defined as samples that are part of the population studying the subject of interest.

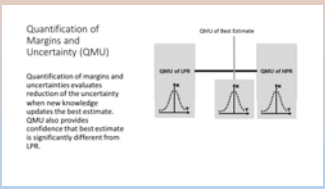
$$k = \frac{M}{U} = \frac{\mu - LPR}{\sigma}$$

k-factor calculation for population

$$\hat{k} = \frac{\hat{M}}{\hat{U}} = \frac{\bar{x} - LPR}{s}$$

Results- Quantification of margins and uncertainty

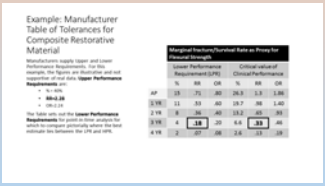
With the QMU of the LPR and UPR, as well as the study samples, researchers may demonstrate sample QMU best estimate is separate (significantly different) from the distribution of LPR, or is part (not significantly different) of the distribution of LPR. If significantly different, then the outcome metric is at a performance greater than LPR. This, then, is the comparison of the best estimate of the LPR with the reported best estimate provided by a Cochrane Review. It is not comparing the reported best estimate with the true value, or population μ.



One more Margin needs to be calculated: Clinician's Critical Value at which functioning is impaired.

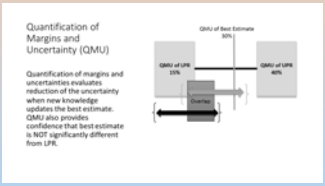
Results-Critical value

The Critical Value (CV) is the value at which the clinician has established as failure to function clinically and replacement is the treatment option. On clinical assessment, this value is the clinician diagnosis of failure not the manufacturer's low performance requirement at time of material failure.



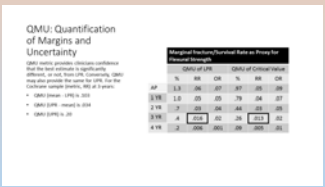
Example

Selecting the Cochrane Oral Health Group Review of comparison between amalgam and composite survival rates at three-year subsequent to point in time analysis, Figure to the right displays the margins (LPR and UPR), best estimates (15% and 40%, respectively), and best estimate (30%) of composite resin material in practice. If for illustration purposes, we show the best estimate in relationship to its margins in the Figure to the right. Here, the clinician observes that the best estimate at this point-in-time analysis is part of the LPR distribution and thus, is performing at a level nearing or at complete disintegration. Intuitively, we may see 30% as a tremendous outcome in comparison to the LPR. However, comparing variance in both distributions demonstrate and overlap that places both in the same distribution. In other words, the distribution of our reported best estimate is part of the distribution of LPR. If the sample size is increased, we may see more separation and obtain a better performance for our reported best estimate.



Cochrane review-QMU

However, the actual result demonstrates that the Cochrane sample's distribution is not part of the distribution of LPR and CV. QMU of the reported best estimate is (mean – LPR) 0.10. This QMU is greater than LPR QMU (0.016) and CV QMU (0.013). Also the Cochrane sample's distribution is not part of the distribution of reported best estimate QMU (UPR – mean). Reported best estimate QMU (0.034). This is less than UPR QMU (0.20). The interpretation is that the Cochrane best estimate of survival rate is better than the LPR and the Critical Value, or minimal clinical requirement, but lesser than the highest expectation of performance, or UPR.



Conclusions

Clinicians and patients need to have confidence that best estimates are nearing the true-value estimate as knowledge improves. To test this behavior, reduction in uncertainty of the best estimate needs to be tested against its thresholds. This reduction in uncertainty is quantified by the k-factor of QMU, the quantification of margins and uncertainties and provides at a given level of confidence if the best estimate is significantly different (or not) from a lower or higher performance requirement and clinical acceptance of functional ability. Once quantified for an acceptable range that demonstrates a steady state, the best estimate may have attained standard of care that approximates certainty of knowledge for a subject of interest. This is a standard of care or QMU value that is stable and will not change. Thus, in clinical practice the QMU of the reported best estimate either reaches the highest level of performance or it remains at a lesser quantification and will not change, or can not be improved further.

SPACKMAN GROUP

Dental student perceptions of older adults in geriatric dentistry curriculum

Presented by:

PI: Sue Spackman, DDS

Co-investigator: Janet Bauer, DDS

Research assistant: Amanjyot Bains, BDS

Introduction

Attitudes possessed by health care providers affect the care of aging patients. Recent studies have suggested that health care providers show confirmation bias in their attitudes toward treating older adults. Specifically, those possessing positive attitudes toward older adults increased those attitudes after pedagogic and clinical training, those possessing negative attitudes confirmed and intensified those negative attitudes, and those who were equipoised remained so.

The purpose of this study was to examine the changes in attitudes in dental students before and after pedagogic training in geriatric dentistry.

PURPOSE

The research question posed is: “Are attitudes towards treatment of dependent elderly different before and after a pedagogic curriculum in experiential learning emphasizing sensitivity training, case simulations, and team training.” Thirty-three subjects completed the Dental Attitudes Intervention Scale to compare pre and post-attitudes
following the intervention of a pedagogic and experiential course in geriatric dentistry. The Dental Attitudes Intervention Scale combined 4 tested and valid questionnaires that included Reuben’s Geriatrics Attitudes Scale, Lindemann’s Self-assessed Clinical Competence Scale, Kiyak’s Dental Student’s Self-assessed Competence in Geriatric Dentistry Scale, and Wood’s Dental Student’s Knowledge and Attitudes Scale. The Wilcoxon Signed Rank
test was used to compare findings at p=.05 significance level.

METHOD

From this pilot study, questionnaire responses changed between pre and post- testing demonstrating polarity
of the results (p=0.52) consistent with confirmation bias, confirming previous findings from geriatric medicine.

Results

Results-Positive attitudes

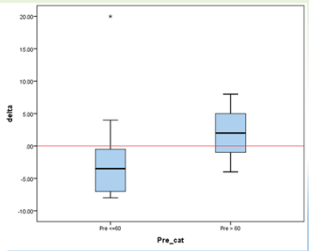
Positive attitudes present before training strengthened after training.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of delta is the same across categories of Pre_cat.	Independent-Samples Mann-Whitney U Test	.006[1]	Reject the null hypothesis.

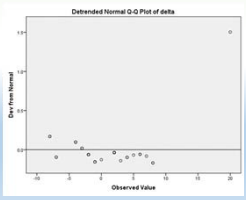
Asymptotic significances are displayed. The significance level is .05.

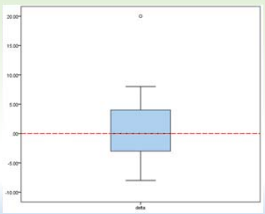
[1]Exact significance is displayed for this test.



Results-Negative attitudes

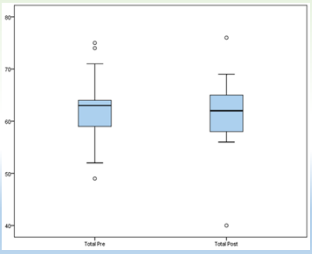
Negative attitudes present before training strengthened after training.





Results-Equipoised attitudes

Equipoised attitudes present before training remained the same.



Conclusions

For dental students completing experiential learning in geriatric dentistry, attitudes toward treating older adults confirmed initial biases that only increased after training. In other words, if you possessed positive attitudes toward aging patients before the course, your attitudes increased. If you possessed negative attitudes toward aging patients, those attitudes intensified.

SPACKMAN GROUP

Mapping Sepsis of Oral Origin
Presented by:
Amanjyot Bains

PI: Sue Spackman, DDS
Co-investigator: Janet Bauer, DDS

Introduction

Sepsis is a whole-body inflammatory response of the immune system triggered by an infection. The infection is commonly by bacteria, but can also be by fungi, viruses, or parasites. Sepsis of oral origin is defined as life-threatening infection originating from the oral cavity leading to severe organ damage, dysfunction, and death. For sepsis of oral origin, little is known about the model of its occurrence, treatment, and outcomes. Diagnosis is based on meeting at least two Systemic Inflammatory Response Syndrome (SIRS) criteria due to an infection.

The purpose of this study is to vest a graph database with data to predict clinical patterns and outcomes of sepsis of oral origin for mapping clinical practice guidelines.

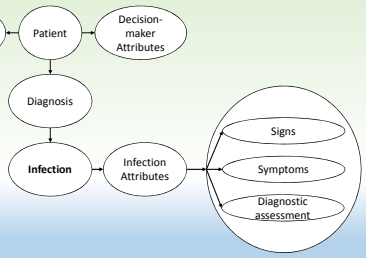
PURPOSE

This study was conducted using a systematic review of the literature to discover evidence related to patterns and outcomes of sepsis of oral origin. A total of 22 papers including 8 case studies were obtained using PubMed and Google scholar. The process to map patterns and outcomes used Neo4j graph database principles. A traversal graph of patterns and outcomes updated Subject Matter Expert level of knowledge of node to node relationships with edge-probabilities reported in the literature to each reported outcome terminus. Data points were subjected to a meta-analysis (p=.05 significance level) when multiple data entries were reported. Averages or weighted average calculations were performed (Shapiro-Wilks, p=.05) when data did not meet the requirements for meta-analysis.

METHOD

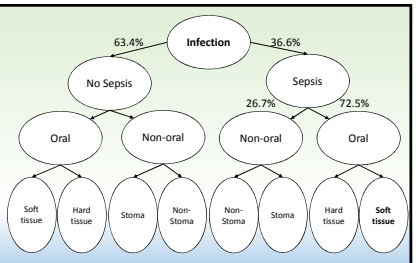
Results

The graph stores data about a subject of interest. The utility of this stored data is used to query the database for information useful in making a clinical decision. The data is stored in such a way that a query filters for the exact content of information needed to individualize data to a patient and the decision that needs to be made. The map begins with a Patient record or conceptual patient node due to compilation of data points rather than single data points as would occur in an actual patient traversing the graph database. The primary node traverses to the other primary nodes.



Results

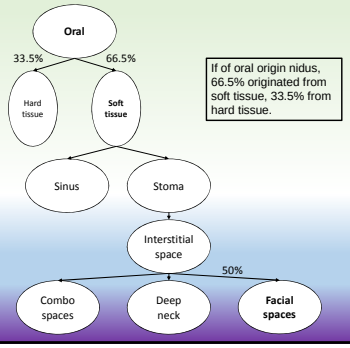
The primary node to node relationships then traverse to the subject of interest, in this case, Infection, Sepsis, No Sepsis, and their subnodes: Origin, Non-oral and Oral involvement, along with their children nodes.



For example, the probability of an infection of oral origin becoming septic (SIRS diagnosis known or unknown) was 36.6%, not septic was 63.4%. If septic, the nidus of infection originated from oral origin 72.5% of the time, from non-oral tissue 26.7% of the time.

Results

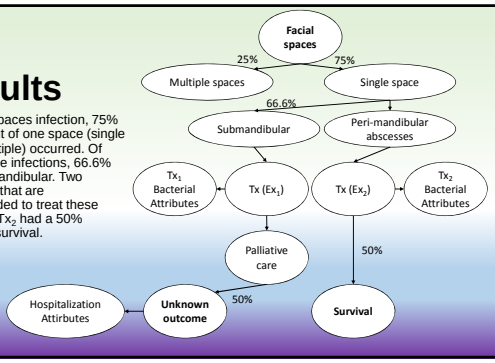
The children nodes traverse to pattern outcome termini. Each is mapped with edge probabilities when data from the literature is evidenced. In all, 135 nodes and sub-nodes were mapped and edge probabilities inputted when evidence.



If of oral origin nidus, 66.5% originated from soft tissue, 33.5% from hard tissue.

Results

Of Facial spaces infection, 75% involvement of one space (single versus multiple) occurred. Of single space infections, 66.6% were submandibular. Two treatments that are recommended to treat these infections, Tx_2 had a 50% chance of survival.



Conclusions

- Mapping of clinical patterns and outcomes using graph database modeling produced the ability to map and store data on sepsis of oral origin and quantitate patient-centered outcomes. With this model, we will be able to increase predictive knowledge for decision-making.

CONCLUSIONS

- In 6 months, the pilot study engaged 7 Clinical Faculty in developing a line of research. These Faculty worked with undergraduate students, mostly pre-dental, from the California State University at San Bernardino.
- These Faculty along with their research assistants produced:
  - 5 research abstracts for the American Association Dental Research meeting in March, 2016
  - 1 research abstract was presented at University of California at San Diego Conference on Gerontology and Geriatrics
  - 1 manuscript has been completed and awaits submission to a professional journal
  - 6 Showcase presentations

CLINICAL FACULTY EBD* MENTORING PROJECT

*EVIDENCED-BASED DENTISTRY

PROBLEM

- Clinical Faculty are required by program requirements to dedicate much of their time to teaching and practice within the general or specialty clinics of the LLU School of Dentistry, extended LLU clinic venues, Faculty Dental Practice, or some combination of all. While their appointment to the University is disproportionally committed to performing these duties and responsibilities, their advancements are predicated on a portfolio of research as well as other creative activities. Most Clinical Faculty have not completed formal time in research methodology or find insufficient time during normal working hours for creative activities. This problem is not a phenomenon of Faculty at LLU professional schools but of many professional schools throughout the US, a fact reported in the literature, and results in (just to name a few):
  - Lack of understanding on part of Administration causing disillusionment and delayed advancement
  - Publications limited to procedure and case reporting
  - Inability to develop a line of research
  - Extended time for completing projects and publications

OPPORTUNITY COSTS

- Most importantly, there is a loss of opportunity to the profession of Clinical Faculty creative, innovative ideas from clinical practice because of these aforementioned barriers.
  - Loss of Access: Cannot tap or canvas creative ideas or interests to enlighten other professionals.
  - Loss of channeling (pipeline) of clinician identification of problems to new knowledge. In other words, loss of clinician process (deductive reasoning) in difference to research process (inductive reasoning).
  - Loss of clinician to clinician communication of ideas for collaboration.
  - Loss contributions to the professional literature.
  - Loss of new lines of discovery and research
  - Loss of recognition and confirmation of the clinician contributions to new knowledge creation and relevance that this new knowledge has to the profession. Investigative questions impacting society are generated from clinical practice not basic research in of itself.

MENTORING PROJECT

Project was developed and is being piloted to assist Clinical Faculty in developing a line of research, first in evidence-based dentistry, then leading to original research. In this manner, a foundation of previous knowledge defining a subject of interest and providing insight as to known variables and findings. From this foundation, theories or hypotheses building may be made for further research. The Research Advisor manages the project. Research assistants perform all research tasks. Meetings are held weekly between Research Advisor and assistants to monitor progress. Formal meetings are held for Clinical Faculty when critical appraisal of progress is needed. OneNote workbooks are developed for each project in which project assigned research assistants input findings of research tasks that may be reviewed by all.

EVIDENCE-BASED PRACTICE AND RESEARCH SYSTEM

Knowledge gained from evidence-based research are being incorporated into a graph database for query by clinicians in practice in generating clinical practice guidelines with cost-effectiveness and benefit trade-off options.

OUTCOMES

- Clinical Faculty develop individual lines of research from which research portfolios are established.
- Research may be reported
  - Abstract presentation
  - Professional presentations
  - Manuscripts for publication
- Students from surrounding colleges and universities interested in careers in healthcare or other client-provider disciplines may participate in research
- Graph database is established to produce LLUSOD-based, clinical practice guidelines for use in asking clinical questions.
- Fosters a more advanced EBD program at LLUSOD.

PROGRAM DIRECTOR

Janet G Bauer, DDS, MSEd, MSPH, MBA

Research Mentor

PROGRAM STAFF

Udo Oyoyo, PhD – Statistician

Research assistants:

Amanjyot Bains, BDS – Lead Research Assistant

Student Research Assistants – California State University at San Bernardino

PROJECTS

- Riter, Holli
  - Studying dental dam outcomes using graph database principles
  - Research assistants
    - Joshua Dimapilis
    - Thalia Milian
- Taylor, L Parnell (Presenter)
  - Theory of Dental Occlusion
  - Research assistants
    - Raquel Lomeli (Presenter)
    - Christopher Phillips (Presenter)
- Omar, Samah
  - Assessing knowledge and attitudes in systematic review using KACE instrument
  - Co-Investigators
    - Afsaneh Matin (Presenter)
    - Jung-Wei Chen
  - Research Assistant – Amanjyot Bains
- Spackman, Sue (Presenter)
  - Dental student perceptions of older adults in geriatric dentistry curriculum
  - Research assistant – Amanyjot Bains
- Fritz, Robert (Presenter)
  - Best Estimate: Quantification of Margins and Uncertainty
  - Research assistant - Jeanette Jetton-Rangel (Presenter)
- Spackman, Sue
  - Mapping sepsis of oral origin
  - Research assistant – Amanjyot Bains (Presenter)

RITER GROUP

Studying dental dam outcomes using graph database principles

Presented by:

PI: Holli Riter, DDS

Co-investigator: Janet Bauer DDS

Research assistants:

Joshua Dimapolis

Thalia Milian

Introduction

Dental dam was invented by Sanford Barnum and popularized in the 1860's for use in surgical dentistry. Today, dental dam is made from latex and non-latex rubber, whose disposable is required after each use. Dental dam is a tool, a part of a dental armamentarium used to achieve the goals of:

- Safety – Shield
  - Preserve the physical presence and function of adjacent anatomical structures to the surgical site
  - Prevent damage to intra-oral structures from and swallowing of surgical projectiles.
  - Prevent incidental iatrogenic surgical error
- Moisture control – Quality assurance of dental material properties in impacting positive outcomes of the subsequent repair or rehabilitation of teeth.
- Efficient isolation of the surgical site
  - Visualization, accessibility, and facilitate surgical procedures of infection or rehabilitation site
  - Controlling the spread of infection
    - From teeth to host
    - Host to host

The purpose of this study is to map clinical patterns and outcomes for use of the dental dam in implementing new technology, graph databases, and mapping clinical practice guidelines in decision-making.

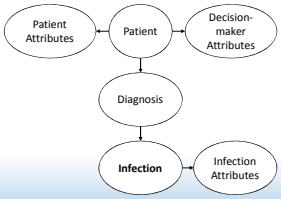
PURPOSE

This study was conducted using a systematic review of the literature to discover evidence related to the goals of the use of the dental dam: safety, moisture control, and efficient isolation of the surgical site. The search bibliome included citations found using PubMed, Google, EBSCOhost, and Science Direct. A total of 50 papers including 2 case studies were obtained, reviewed, and analyzed. Patterns and outcomes were mapped using Neo4j graph database principles. A traversal graph of patterns and outcomes achieved Subject Matter Expert level of knowledge of node to node relationships with edge-probabilities to each reported outcome terminus. Data points were averaged due to the limited amount of data available. The parametric Shapiro-Wilks at p=.05 significance level was used to quantify the result.

METHOD

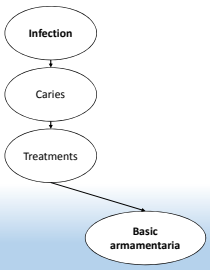
Results

The graph stores data about a subject of interest, in this case Dental Dam. The utility of this stored data is used to query the database for information useful in making a clinical decision. The map begins with a Patient record or conceptual patient node due to compilation of data points rather than single data points as would occur in an actual patient traversing the graph database. The primary nodes are presented here.



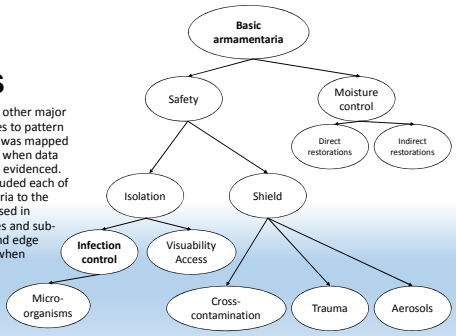
Results

From the primary node to node relationships, the graph traverses to the subject of interest nodes: Caries, Treatment with Attribute node, Basic Armamentarium.



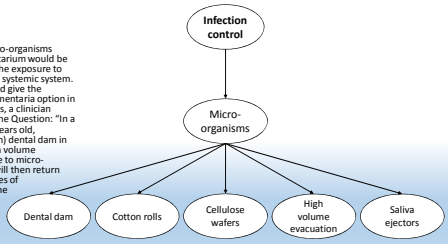
Results

Graph then brakes into other major and their children nodes to pattern outcome termini. Each was mapped with edge probabilities when data from the literature was evidenced. Mapped outcomes included each of alternative armamentaria to the dental dam currently used in practice. In all, 61 nodes and sub-nodes were mapped and edge probabilities inputted when evidenced.



Results

For example, the node Micro-organisms would map what armamentarium would be most effective in reducing the exposure to the patient, or the patient's systemic system. The edge probabilities would give the effectiveness of each armamentaria option in reducing this exposure. Thus, a clinician querying the database for the Question: "In a diabetic patient who is 40 years old, diagnosis of HIV, will (option) dental dam in comparison to (option) high volume evacuation reduce exposure to micro-organisms." The database will then return the comparative probabilities of effectiveness for deciding the best option to use in this case.



Conclusions

Mapping of the clinical patterns and outcomes produced a computational model at a Subject Matter Expert level of knowledge regarding the dental dam. With this model and further research using systematic review and existing database resources, we will be able to increase our predictive knowledge of the outcomes of the use of the dental dam for surgical dentistry along with validating the model.

TAYLOR GROUP

Dental Occlusion

Presented by:
PI: Parnell Taylor, DDS
Chris Phillips
Raquel Lomeli

Co-Investigator: Janet Bauer, DDS
Research assistant: Amanjyot Bains, BDS

Introduction

Occlusal determinants were initially formulated and developed for non-dentate patients who required complete prosthetic rehabilitation of the mandibular and maxillary jaws. Between the 1910s and 1960s, these determinants were refined and applied to dentate patients requiring fixed prosthodontic restoration or rehabilitation of the natural dentition. Presently, dental occlusion has been defined by determinants of inter-cuspal contact relationships and the function of closure. However, validation of these determinants have not been supported by epistemological concepts only observation.

The purpose of this line of investigation is to validate a theory of dental occlusion: Theory is stated - Dental occlusion is the most antero-superior location of the mandibular condyle situated in the mandibular (glenoid) fossa that satisfies the equation centric relation is equivalent to centric occlusion is equivalent to maximum inter-cuspal position (CR=CO=MIP). When this formula is satisfied, little to no occlusal wear is evidenced from functions of closure or chewing.

PURPOSE

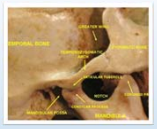
Dental Occlusion

- *Centric relation (CR)
- *Centric occlusion (CO)
- *Maximum inter-cuspal position (MIP)

Concepts

Centric relation

Centric relation is the most antero-superior positioning of the condyles within the mandibular (glenoid) fossa against the thinnest avascular portion of the articular disc.

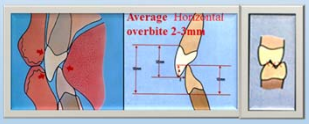


Centric occlusion

Centric occlusion is the first occlusal contact occurring while the condyles are in centric relation.

MIP

Maximal intercuspation (MIP) is the cusps of the teeth of both arches fully interposing themselves with the cusps of the teeth of the opposing arch.



Outcome

Little to no occlusal wear evidenced in the adult dentition.

The first phase of this line of investigation is to study centric relation, the mandibular fossa, temporomandibular joint and its anatomical and biological structures. A bibliome of 137 references were retrieved and reviewed for content. Timelines of cellular, anatomical, and biological structures was developed to establish study variables to conceptualize centric relation.

METHOD

Two timelines, while continuous, were distinct in their approaches to centric relation. First timeline chronicled animal development of the Temporomandibular Joint space (Temporal fossa) appearing over 2.5 million years ago. The variables most important in predicting evolutionary and anatomical changes in modern humans (appearing over 250,000 years ago).

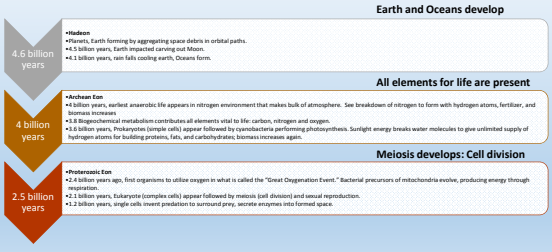
Results

First Timeline

Presented by

Christopher Phillips

Timeline in context



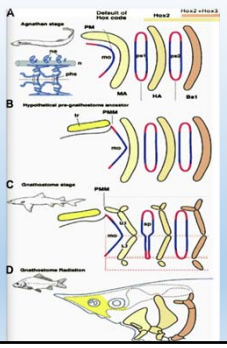
Environment

Innovations: From single cell animals to complex animals

Cartilage, Gills, Bone, Teeth

Major innovation Pre-cursor to Mandibular Jaw

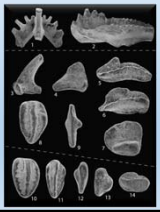
Figure to right shows the enlargement of the first gill arch, managed by D1x homeobox genes, to form a lower jaw



Into the Cambrian Explosion

Multicellular animals whose many cells take on the structure of organs having specialized tasks or function.

- 600 million years, multicellularity appears in which dividing cells bond and associate together; These are Ediacarans whose innovations include cells specializing in different tasks and emergent structures appearing. Thus, simple animals, Urmetazoan hypothesized as the last common ancestor of all animals, appear possessing nerves, brains, muscles, eyes and internal organs. **Gills were formed and used both for feeding and breathing.** These animals are considered the link between vertebrates and invertebrates.
- 550 million years, Cambrian explosion when most modern phyla of animals begin to appear.
- 505 million years, Ostracoderms (Chordates: Agnatha) were the first fish to use **gills exclusively for breathing.** They were the first vertebrates; they were armored but jawless fish, called "round mouths," having to constantly cycle water due to the lack of a jaws (**buccal pump**).
- These were the earliest creatures to have bony heads, large solid dorsal and ventral head shield. This bony skull consisted of the same structure as teeth (**dermal armor**), a layer of enamel and a layer of pulp, fused together. These **teeth-like structures appear in Conodonts (495 million years) and were used for grasping and crushing.**



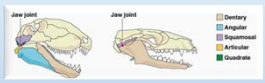
True teeth evolved through the extension of dental armor from the external dermis to internal epithelium soon after the origin of jaws. Thus, dermal teeth were hard structures found on the external surfaces of animals or near internal openings. Dermal teeth were composed of soft pulp surrounded by dentine and covered by a mineralized substances such as enamel.

True Teeth

Placoderm

Major innovation: Appearance of Mandibular Jaw as Dentary bone (plate)

Primitive mandibular jaw was composed of many plates that later would fuse to form one plate, Dentary bone (mandibular jaw)



Primitive jaw Mammalian jaw

Results-First timeline…

542 million years

- **Phanerozoic Eon**, called the "period of well-displayed life," subdivided into the Paleozoic, Mesozoic, and Cenozoic eras.
- **Paleozoic era**
  - 535 million years, chordates appear branching into two species invertebrates and vertebrates or fish. **This is resulted in the enlargement of the first gill arch, managed by D1x homeobox genes, to form a lower jaw. This modification into a mandibular jaw gave vertebrate fish the ability to grasp and take in larger prey.** Jaws allowed vertebrates to reach much larger sizes and dominant and replace jawless forms. With the buccal (muscular) pump mechanism in Ostracoderms, the mouth grew wider and bigger; it also became stronger and tougher; this paved the way for the transformation into real jaws.

480 million years

- **Placoderm** (Craniata: Gnathostomata) were some of the first jawed fishes. Their head and thorax were covered by articulated armored plates. Their jaws contained true teeth, a **dentary bony** mandibular arch that articulated. Placoderms show a rudimentary synovial joint.

390 million years ago, lungfishes precursor to the Tetrapods, developed primitive synovial joints, found only in the jaws.

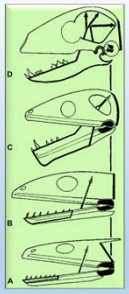
Innovation: Synovial joint

Synovial joints are freely mobile joints where ligaments generally connect the bones. These joints contain synovial fluid in a space (joint cavity) between the bones that helps create a cushion and smooth movement. Synovial joints contain:

*Socket
*Meniscus-crescent, increasing the size of articular surfaces
*Meniscus of fibrocartilage allowing the potential of the TMJ to have movements in several directions on an xyz axis.

Concurrent innovation: Cartilaginous joints

Synovial, hinged joint – Temporomanidibular joint (TMJ)



Large pressures exerted on the bones might then bring the cartilage-covered ends into contact, in conjunction with a developing system of lubrication. These are **hinged joints with gliding (one surface over another) and angulation (extension, flexion, roll)**

Tetrapods

Next innovation: Transition of ocean dwellers to land dwellers

Reduction in size and number of bones

410 million years

•Devonian era
•Proliferation of land plants contributed to the increase of oxygen in the atmosphere. This was the precursor to animals from the ocean to colonize land.
•The Elpistostegalians lived in shallow waters which had less oxygen than the ocean. The lack of oxygen in the shallow waters caused these animals to develop modified swim bladder which acted as lungs. The modified swim bladder allowed the epistostegalians to use atmospheric oxygen to help with cellular respiration. Around 390 million years, fresh water lobe-finned fish (Sarcopterygii) developed adaptations of fins with fleshy bases and bones to navigate these shallow waters. These tetra-pod fishes used their fins as paddles.

- Early tetrapods did not develop on land but instead in shallow waters where there was a wider selection of food sources. While their innovation was proto-lungs and proto-limbs, they showed **no modifications to their skull or jaw**. This disallowed land prey as food sources.
- Tetrapods would eat in water where the hydrodynamic forces from expanding buccal walls of the oral cavity would force food into the esophagus.
- The actual transition from water to land is theorized to have occurred because of the strengthening of the head and jaws. This, then, allowed for **less dependency on water hydrodynamics and led to the dietary inclusion of land prey.**
- **Synovial joints** come into their own with potential of independent mandibular jaw.

Results-First timeline…

256 million years

300 million years

365 million years

Mammals (Synapsids)

Reptiles (Amniotes)

Amphibians

Sharp teeth
Innovation:
Keratin (claws)

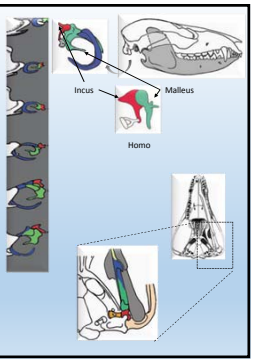
No major innovations during this period of change

Pre-cursor Tempromandibular joint

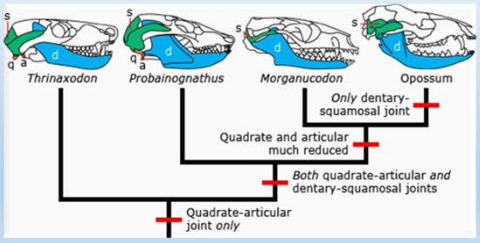
Innovation: Glenoid fossa
Development of the temporal fossa
(Temporomandibular joint)

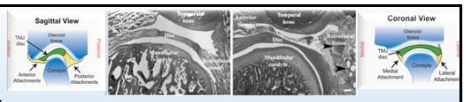
Synapsids

- From the Tetrapods came the Synapsids. **The Synapsid innovation was the development of the mandibular fossa** (glenoid fossa of the temporal bone).
- The joint of the early Synapsid was composed of the squamosal, quadrate, articular, and dentary bones. An elongation of the sutures uniting different bones, progressively led to their separation and transversal orientation. The squamosal bone became located along the quadrate in the skull and the dentary with the articular.
- It is then believed that the articular and quadrate bones moved into the middle ear region to form the malleus and incus.
- The loss of the quadrate-articular bones is what separates the tetrapods from the early mammals, now having developed a dentary-squamosal formed fossa.



Summary of development of the mammalian fossa showing bone separation and orientation





*Mandibular jaw
*Synovial joint
*Hinged joint: gliding and angulation movements (degrees of freedom, xyz axes)
*Temporomandibular joint with movement in potentially independent directions
*Articulation of teeth
*Loading pressure: 2500 to 6000 psi (context: human is 120 psi)

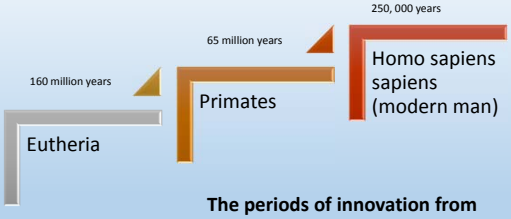
Summary: Innovations of the first time-line of evolution of centric relation

2nd Timeline

Presented by
Raquel Lomeli

Innovation: Adaptation to environment

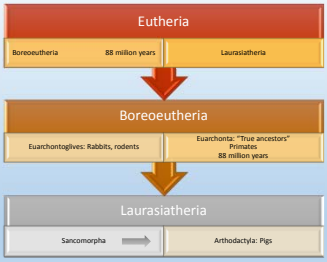
Results: Second timeline…



The periods of innovation from Class Eutheria to Class Homo sapiens sapiens, or Modern Man

Eutheria Tree (Partial)

Eutherians are of the Class Mammalia. Eutherians are important to centric relation because **Superorders of these animals are used to study the Temporomandibular joint.** Specifically, these animals include: Rabbits, rodents, primates, pigs, and cattle. There is one area which remains a problem and that is function. Muscles, movements, and joint loads are very species-dependent.



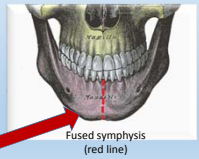


Primate: Plesiadapis innovation was side placement of the eyes limiting their habitat to the ground. Because they could only reach the lower branches of trees, their **diets changed to fruits and leaves**. Previous Euarchontas were small animals feasting on insects.

Adaptation



Primate: Haplorrhini innovation was eyes forward. This trend is linked to an increasing reliance on vision and a decreasing reliance on smell. **The lower halves of haplorhine lower jaws are fused together (fused symphysis).** The incisors are spatulate or shovel-like. There is a space - a diastema - between the upper lateral incisor and the upper canine tooth. The size of the molar teeth increases towards the back of the mouth. Most importantly, Haplorrhini metabolism lost their ability to produce Vitamin C, thus fruit became a major food source to compensate.



Adaptation

Both condyles must work in unison

Eutherian importance in studying human centric relation: **Animal Models**

Sheep, goats, cattle

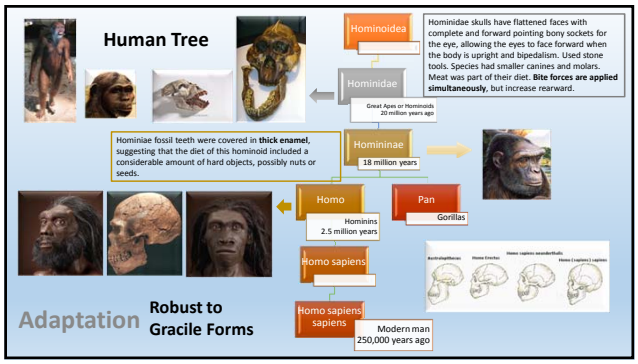
- Sheep, goats and cattle are closely related ruminant artiodactyls and have essentially identical TMJs. This group of ungulates has a distinctive jaw apparatus specialized for an herbivorous diet. The condyle is concave. The TMJs are specialized for great mobility in the transverse plane. **Muscle activity patterns and loading of facial bones are studied for establishing determinants for the human jaw.**

Pigs

- Moderate movements in all planes are permitted and The condyle is compressed and probably twisted during chewing, whereas the lateral surface of the temporal bone is bent. **More general features of pig oral behavior and muscle contraction are known as well. All these are similar to that of higher primates.**

Rabbits, rodents

Masticatory function in rabbits are used to determine calculations of TMJ loads based on muscle activity. In rabbits, the working side condyle may be completely unloaded during the power stroke of chewing.
In rats (and mice), the TMJ is highly specialized for extensive protrusive movements, much more so than the rabbit. The rounded condyle travels in a trough-like temporal fossa and the power stroke is in the protrusive direction with only a minor medial component. However, long-axis rotation can occur around a mobile symphysis (fused in human mandibles).



Homo sapiens Adaptation

- Evolutionary cascade: Change in the shape of the head and jaws.
- The discovery of a mutation, MYH16 gene, which rendered inactive muscles produced for some jaw muscles for chewing and biting.
- Gracile human jaw in contrast to the protruding jaw and facial ridges (robust form). A mandibular jaw that was smaller, forming a triangularly shaped chin, and longer faces with sides parallel.
- Researchers suggest that this difference in muscle structure was part of other changes, dietary among them. These changes were already in progress and contributed to the traits in the human jaw that separated it from the jaw of hominin predecessors.

Conclusions

*In the first phase of centric relation evolution, structural innovations gave rise to the eventual human jaw. The second phase, dietary changes superseded structural changes that eventually gave rise to the human jaw and its teeth.

*Maxillary teeth articulated with mandibular teeth; some evidence indicating this articulation was simultaneous.

*Several mutations led to the inclusion of fruit as a major food source due to the lack of intrinsic production of Vitamin C. Other mutations, MYH16 gene, also rendered inactive some jaw muscles for chewing and biting. These changes produced longer faces, smaller jaws, and triangularly shaped chins. All these made them distinct from predecessors to Homo sapien. Thus, robust attributes delined and more gracile attributes dominated.

*Study of centric relation uses animal models that may mimic neuromuscular activity; protrusive, superior-posterior, and rotational movements; along with loading pressure.

OMAR GROUP

Accessing knowledge and attitudes in systematic review using KACE instrument

Presented by:

Afsaneh Matin, DDS

PI: Samah Omar, BDS, DDS, MSD

Co-Investigors: Janet Bauer, DDS, MSEd, MSPH, MBA

Jung-Wei Chen, DDS

Research assistant: Aman Bain, BDS

Introduction

Journal Clubs in pediatric residency programs are integral to dental education and decision-making. Journal Clubs typically provide residents with a portfolio of articles relevant to their discipline and discuss findings. The goals of the LLU Pediatric Dentistry Journal Club is to promote critical thinking, apply EBD principles to assessing Pediatric Dentistry proessional literature, and improve pedagogic outcomes. Accrediting agencies have encouraged incorporating evidence-based research for systematic review of articles to assess research quality as well as findings. While this implementation is on-going, few have studied the knowledge and attitudes of pediatric residents toward evidence-based dentistry and systematic review.

The purpose of this pilot study is measure the outcome of EBD training by assessing pediatric dentistry residents' knowledge and attitudes in performing systematic reviews.

PURPOSE

The study sample consisted of 7 subjects: 4 first-year residents, who had no prior exposure to research or EBD within the program, and 4 second-year residents, who had, prior to the study, lectures in research design along with a 4 hour presentation in EBD. Preservation of knowledge (correct answers) and attitudes were assessed using Knowledge, Attitude, Access, and Confidence Evaluation (KACE) instrument for the time periods: Pre-assessment to post training (existing knowledge), post training to 6-months (training knowledge), and pre-assessment to 6-months (existing knowledge). The non-parametric Fisher's exact test was used to evaluate knowledge data and Friedman's test to evaluate attitude data. KACE is a standardized assessment instrument previously validated to measure knowledge and attitudes toward systematic reviews.

METHOD

Null Hypotheses

- There is no difference in pediatric residents' knowledge and attitudes toward systematic reviews between pre-assessment, post-assessment, and 6-months post-assessment.
- There is no difference between first and second-year pediatric residents regarding their attitudes toward EBD.

Significant differences between time periods were found in knowledge and attitudes as well as between first-year and second-year residents.

Results

Results-Knowledge

A 4-hour introductory lecture in EBD did not increase knowledge. Existing knowledge was preserved. However, existing and training knowledge declined considerably in the following 6 months (p=.05).

Correct answers were preserved at 73% from pre-assessment to post-lecture indicating that training did re-enforce existing knowledge in evidence-based dentistry but with some decrement. This decrement resulted in a decrease of correct answers by 27%. Six months following post training and pre-assessment, decrements in correct answers were observed. As a result, existing knowledge decreased at a rate of 54%, but stayed higher in preservation of correct answers than the decrement following training knowledge (48%).

Consistency rate of answers

Result	Pre-assessment	Post-assessment	6-months assessment
Consistency of correct answers	**73% (19/26)**	**48% (12/25)**	**54% (14/26)**
Consistency of incorrect answers	86% (38/44)	80% (36/45)	84% (37/44)
Change of correct answers to incorrect answers	27% (7/25)	52% (14/25)	46% (12/26)
Change of incorrect to correct answers (reversals)	14% (6/44)	20% (9/45)	16% (7/44)

Results-Knowledge

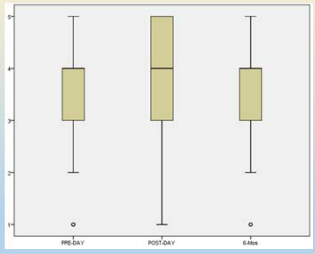
First and second-year residents had similar, low rates of preservation of correct answers for existing knowledge and training knowledge. Existing knowledge decrease at a higher rate for first-year students than second-year students. Training knowledge was preserved but comprehension was low (p=.05).

Comparison of consistency rate between first and second-year residents

Year	Pre-assessment	Post-assessment	6-months assessment
First	32% (13/40	32% (13/40)	28% (11/40)
Second	43% (13/30	40% (12/30)	33% (10/30)

Results-Attitudes

Attitudes were positive, median of 4 on a scale of 1-5 (most positive) with regard to the value of EBD in practice (p=.05). First-year residents demonstrated higher positive attitudes post training than second-years. At 6-months, however, these attitudes returned to match second-year attitudes which were rated consistently positive across the time periods. Success of post training showed changes in attitude with positive ratings increasing to 60% post training, a decrease in those equipoised, 8%, and an increase in negative ratings by 11%.



Conclusions

Using KACE, existing and training knowledge demonstrated high retention rates immediately post training. At 6-months, however, these rates declined with low comprhension. Attitudes, however, were consistently positive to the value of EBD in practice.

FRITZ GROUP

Best Estimate: Quantification of Margins and Uncertainty

Presented by:
PI: Robert Fritz, DD
Jeanette Jetton-Rangel

Co-Investigator: Janet Bauer, DDS

Introduction

One goal of evidence-based dentistry is to provide clinicians and patients with best evidence, or best estimates of intervention outcomes that are directed to uncertainties in decision-making when developing personal oral healthcare plans. Best estimates are usually focused on decision data and are augmented with clinician expertise and experience within informed consent. However, a common complaint of clinicians is that best estimates are often, out of necessity, from a context of less than quality evidence or needing more evidence to provide accuracy.

The purpose of this study is to understand best estimate behavior such that clinicians and patients may have confidence in its quantification and validation in decision-making.

PURPOSE

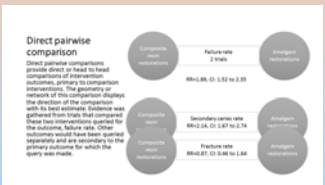
In evidence-based research (EBR), a best estimate is a quantification of many observable events, but not all events, of an outcome regarding a subject of interest, along with quantification of that portion of unknown knowledge explainable as uncertainty or error in measurement. Thus, knowledge about a subject of interest is based on observation (epidemiological knowlege), not deductive reasoning of cause and effect (epistemological knowledge). In stochastic environments, we are not able to observe all events in all situations to know without uncertainty a subject of interest and its predictable outcomes. To discover best estimates and quantify uncertainty, critical appraisals of the literature, gray literature and its resources, or both are accomplished using individual, primary source articles and systematic reviews of systematic review of a compilation of other systematic reviews. Thus, best estimates of outcomes focus on evidence-centered care; it is all about the evidence and decision-making, not engaging providers or patients. This engagement comes later in the whole dynamic of understanding a clinical practice guideline.

METHOD

The Evidence in determining the Best Estimate

Results-Direct pairwise comparisons

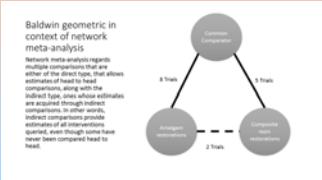
Best estimates come from studies that use pairwise comparisons. Pairwise comparisons are calculated using meta-analytic methods. If multiple comparisons are needed then evidence has to be found that includes all the comparison options. Multiple comparisons use network meta-analysis to calculate best estimates.



The Evidence in determining the Best Estimate

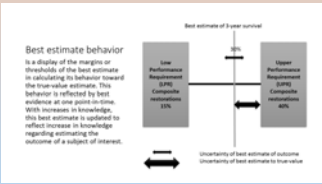
Results-Network meta-analysis

Network meta-analysis (NMA) brings together estimates of outcomes reported using direct comparisons and combines them with estimates of outcomes reported as indirect comparisons. This is done by using comparator estimates whose relationships are pictorially displayed as a network. The outcome of these relationships is to compare every pairwise comparison that is possible within a then developed network. A unified analysis is performed to determine the best estimate of all pairwise analyses.



Results-Reducible uncertainty

How do evidence-based researchers know when best estimates of outcomes are close to true-value? For example, we are looking at composite restorative materials to develop clinical practice guidelines for expected performance using a point-in-time analysis. There may be several points in time that we would want to look at for different reasons: At placement to provide clinicians with estimates as to procedural competence, at subsequent restorative performance over a given duration, and up to and when failure of the restoration is expected. Thus, dentist may wish to know how the best estimate is behaving given the Lower Performance Requirement (or complete failure) and the Upper Performance Requirement (or the highest performance at which the subject of interest can reach).



Quantification of Margins and Uncertainty of the best estimate

Presented by:
Jeanette

How do we explain these Margins (LPR and UPR)?

- First, we ask Manufacturers or Dentists what is their estimate of the LPR, or restoration disintegration, and the estimate of the UPR, or restoration's highest expectation of function. We compile this data and use Shaprio-Wilks (W) statistic to determine the distribution of an average estimate for each end-point. From this distribution, we now have a best estimate for each end-point, its mean and standard deviation.
- Second, we wish to determine what is the true value of this best estimate for each end-point. From the W statistics, we are also given the population variance, SE or standard error, from which we can determine how close the best estimate is to the true value (μ of the population distribution).
- Third, Cochrane Reviews may give the dentist a best estimate (derived from a systematic review) that we can now determine if it overlaps the distribution of the LPR or UPR or is somewhere in-between.
- Also, we can also calculate a QMU value, or a value that quantifies each margin and variance of its distribution to establish one measure that can be used to compare other QMU to see their equitability or distance from other QMUs.
- In the following sides, I will explain this process such that I am taking a reported best estimate and determining if I can have confidence that it is part of the UPR distribution (restoration functioning at its highest expectation), LPR distribution (restoration disintegration), or somewhere in-between.
- I also can determine if the best estimate is approaching the true value of either the UPR or LPR.

Results- Quantification of margins and uncertainty

Point-in-time analysis of QMU (REF) is based on the calculation of a k-factor that is defined as margin divided by uncertainty in a study population regarding an outcome metric, or comparator characteristic of the interventions. Thus, the k-factor is the population mean (μ) minus LPR divided by the population variance.

Since researchers estimate the population mean from study samples, the estimate of the k-factor is the mean of study samples (x) minus LPR divided by standard deviation (s) of the study samples. These study samples are defined as samples that are part of the population studying the subject of interest.

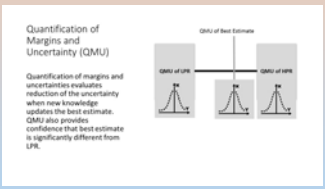
$$k = \frac{M}{U} = \frac{\mu - LPR}{\sigma}$$

k-factor calculation for population

$$\hat{k} = \frac{\hat{M}}{\hat{U}} = \frac{\bar{x} - LPR}{s}$$

Results- Quantification of margins and uncertainty

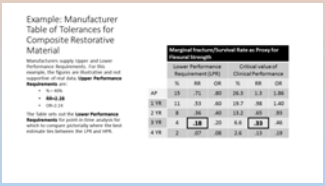
With the QMU of the LPR and UPR, as well as the study samples, researchers may demonstrate sample QMU best estimate is separate (significantly different) from the distribution of LPR, or is part (not significantly different) of the distribution of LPR. If significantly different, then the outcome metric is at a performance greater than LPR. This, then, is the comparison of the best estimate of the LPR with the reported best estimate provided by a Cochrane Review. It is not comparing the reported best estimate with the true value, or population μ.



One more Margin needs to be calculated: Clinician's Critical Value at which functioning is impaired.

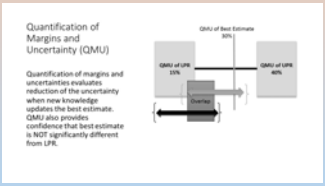
Results-Critical value

The Critical Value (CV) is the value at which the clinician has established as failure to function clinically and replacement is the treatment option. On clinical assessment, this value is the clinician diagnosis of failure not the manufacturer's low performance requirement at time of material failure.



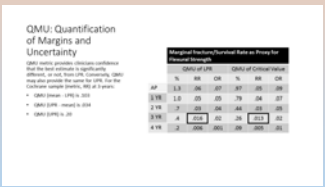
Example

Selecting the Cochrane Oral Health Group Review of comparison between amalgam and composite survival rates at three-year subsequent to point in time analysis, Figure to the right displays the margins (LPR and UPR), best estimates (15% and 40%, respectively), and best estimate (30%) of composite resin material in practice. If for illustration purposes, we show the best estimate in relationship to its margins in the Figure to the right. Here, the clinician observes that the best estimate at this point-in-time analysis is part of the LPR distribution and thus, is performing at a level nearing or at complete disintegration. Intuitively, we may see 30% as a tremendous outcome in comparison to the LPR. However, comparing variance in both distributions demonstrate and overlap that places both in the same distribution. In other words, the distribution of our reported best estimate is part of the distribution of LPR. If the sample size is increased, we may see more separation and obtain a better performance for our reported best estimate.



Cochrane review-QMU

However, the actual result demonstrates that the Cochrane sample's distribution is not part of the distribution of LPR and CV. QMU of the reported best estimate is (mean – LPR) 0.10. This QMU is greater than LPR QMU (0.016) and CV QMU (0.013). Also the Cochrane sample's distribution is not part of the distribution of reported best estimate QMU (UPR – mean). Reported best estimate QMU (0.034). This is less than UPR QMU (0.20). The interpretation is that the Cochrane best estimate of survival rate is better than the LPR and the Critical Value, or minimal clinical requirement, but lesser than the highest expectation of performance, or UPR.



Conclusions

Clinicians and patients need to have confidence that best estimates are nearing the true-value estimate as knowledge improves. To test this behavior, reduction in uncertainty of the best estimate needs to be tested against its thresholds. This reduction in uncertainty is quantified by the k-factor of QMU, the quantification of margins and uncertainties and provides at a given level of confidence if the best estimate is significantly different (or not) from a lower or higher performance requirement and clinical acceptance of functional ability. Once quantified for an acceptable range that demonstrates a steady state, the best estimate may have attained standard of care that approximates certainty of knowledge for a subject of interest. This is a standard of care or QMU value that is stable and will not change. Thus, in clinical practice the QMU of the reported best estimate either reaches the highest level of performance or it remains at a lesser quantification and will not change, or can not be improved further.

SPACKMAN GROUP

Dental student perceptions of older adults in geriatric dentistry curriculum

Presented by:

PI: Sue Spackman, DDS

Co-investigator: Janet Bauer, DDS

Research assistant: Amanjyot Bains, BDS

Introduction

Attitudes possessed by health care providers affect the care of aging patients. Recent studies have suggested that health care providers show confirmation bias in their attitudes toward treating older adults. Specifically, those possessing positive attitudes toward older adults increased those attitudes after pedagogic and clinical training, those possessing negative attitudes confirmed and intensified those negative attitudes, and those who were equipoised remained so.

The purpose of this study was to examine the changes in attitudes in dental students before and after pedagogic training in geriatric dentistry.

PURPOSE

The research question posed is: “Are attitudes towards treatment of dependent elderly different before and after a pedagogic curriculum in experiential learning emphasizing sensitivity training, case simulations, and team training.” Thirty-three subjects completed the Dental Attitudes Intervention Scale to compare pre and post-attitudes
following the intervention of a pedagogic and experiential course in geriatric dentistry. The Dental Attitudes Intervention Scale combined 4 tested and valid questionnaires that included Reuben’s Geriatrics Attitudes Scale, Lindemann’s Self-assessed Clinical Competence Scale, Kiyak’s Dental Student’s Self-assessed Competence in Geriatric Dentistry Scale, and Wood’s Dental Student’s Knowledge and Attitudes Scale. The Wilcoxon Signed Rank
test was used to compare findings at p=.05 significance level.

METHOD

From this pilot study, questionnaire responses changed between pre and post- testing demonstrating polarity
of the results (p=0.52) consistent with confirmation bias, confirming previous findings from geriatric medicine.

Results

Results-Positive attitudes

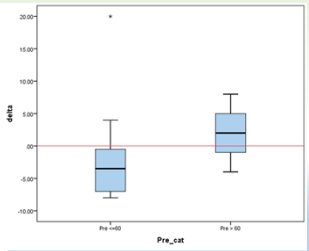
Positive attitudes present before training strengthened after training.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of delta is the same across categories of Pre_cat.	Independent-Samples Mann-Whitney U Test	.006[1]	Reject the null hypothesis.

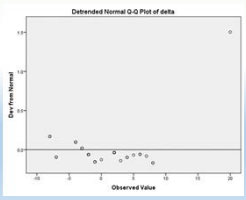
Asymptotic significances are displayed. The significance level is .05.

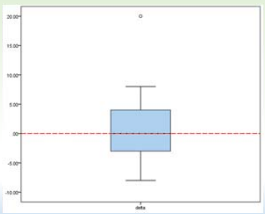
[1]Exact significance is displayed for this test.



Results-Negative attitudes

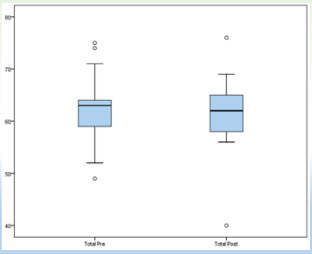
Negative attitudes present before training strengthened after training.





Results-Equipoised attitudes

Equipoised attitudes present before training remained the same.



Conclusions

For dental students completing experiential learning in geriatric dentistry, attitudes toward treating older adults confirmed initial biases that only increased after training. In other words, if you possessed positive attitudes toward aging patients before the course, your attitudes increased. If you possessed negative attitudes toward aging patients, those attitudes intensified.

SPACKMAN GROUP

Mapping Sepsis of Oral Origin
Presented by:
Amanjyot Bains

PI: Sue Spackman, DDS
Co-investigator: Janet Bauer, DDS

Introduction

Sepsis is a whole-body inflammatory response of the immune system triggered by an infection. The infection is commonly by bacteria, but can also be by fungi, viruses, or parasites. Sepsis of oral origin is defined as life-threatening infection originating from the oral cavity leading to severe organ damage, dysfunction, and death. For sepsis of oral origin, little is known about the model of its occurrence, treatment, and outcomes. Diagnosis is based on meeting at least two Systemic Inflammatory Response Syndrome (SIRS) criteria due to an infection.

The purpose of this study is to vest a graph database with data to predict clinical patterns and outcomes of sepsis of oral origin for mapping clinical practice guidelines.

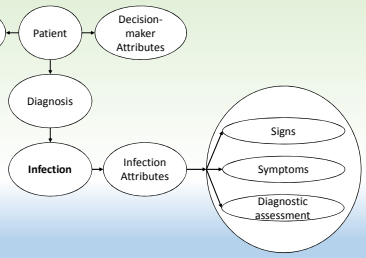
PURPOSE

This study was conducted using a systematic review of the literature to discover evidence related to patterns and outcomes of sepsis of oral origin. A total of 22 papers including 8 case studies were obtained using PubMed and Google scholar. The process to map patterns and outcomes used Neo4j graph database principles. A traversal graph of patterns and outcomes updated Subject Matter Expert level of knowledge of node to node relationships with edge-probabilities reported in the literature to each reported outcome terminus. Data points were subjected to a meta-analysis (p=.05 significance level) when multiple data entries were reported. Averages or weighted average calculations were performed (Shapiro-Wilks, p=.05) when data did not meet the requirements for meta-analysis.

METHOD

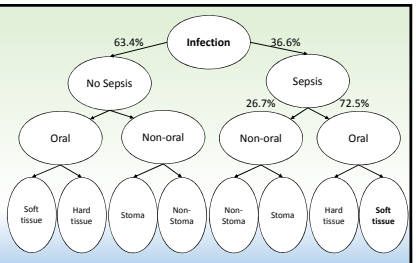
Results

The graph stores data about a subject of interest. The utility of this stored data is used to query the database for information useful in making a clinical decision. The data is stored in such a way that a query filters for the exact content of information needed to individualize data to a patient and the decision that needs to be made. The map begins with a Patient record or conceptual patient node due to compilation of data points rather than single data points as would occur in an actual patient traversing the graph database. The primary node traverses to the other primary nodes.



Results

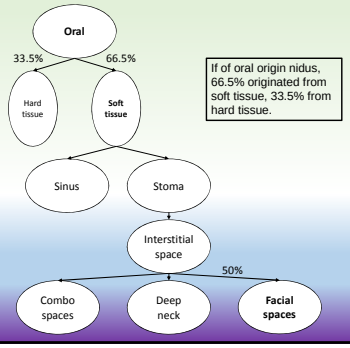
The primary node to node relationships then traverse to the subject of interest, in this case, Infection, Sepsis, No Sepsis, and their subnodes: Origin, Non-oral and Oral involvement, along with their children nodes.



For example, the probability of an infection of oral origin becoming septic (SIRS diagnosis known or unknown) was 36.6%, not septic was 63.4%. If septic, the nidus of infection originated from oral origin 72.5% of the time, from non-oral tissue 26.7% of the time.

Results

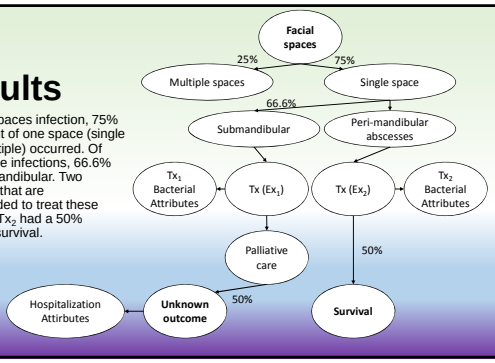
The children nodes traverse to pattern outcome termini. Each is mapped with edge probabilities when data from the literature is evidenced. In all, 135 nodes and sub-nodes were mapped and edge probabilities inputted when evidence.



If of oral origin nidus, 66.5% originated from soft tissue, 33.5% from hard tissue.

Results

Of Facial spaces infection, 75% involvement of one space (single versus multiple) occurred. Of single space infections, 66.6% were submandibular. Two treatments that are recommended to treat these infections, Tx_2 had a 50% chance of survival.



Conclusions

- Mapping of clinical patterns and outcomes using graph database modeling produced the ability to map and store data on sepsis of oral origin and quantitate patient-centered outcomes. With this model, we will be able to increase predictive knowledge for decision-making.

CONCLUSIONS

- In 6 months, the pilot study engaged 7 Clinical Faculty in developing a line of research. These Faculty worked with undergraduate students, mostly pre-dental, from the California State University at San Bernardino.
- These Faculty along with their research assistants produced:
  - 5 research abstracts for the American Association Dental Research meeting in March, 2016
  - 1 research abstract was presented at University of California at San Diego Conference on Gerontology and Geriatrics
  - 1 manuscript has been completed and awaits submission to a professional journal
  - 6 Showcase presentations