# A Comparison of Clinical Competency Between Dental Therapy and Dental Students in a Dental School

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BY

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Dedications

I dedicate the writing of the thesis to my wife, Anna, and my daughter, Isabelle, which have helped encourage me through the process.

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## INTRODUCTION

To address oral health disparity, New Zealand created a new allied dental provider known as a dental nurse, which as transition to a dental therapist. Since that time dental therapy has been adopted in over 50 countries worldwide. (1) While the dental therapy scope of practice varies, in most countries dental therapists are able to perform both preventive and restorative services. Dental therapy was introduced in the United States in 2005 by the Alaska Native Tribal Health Consortium to improve access to oral health care for the Alaskan natives living in tribal villages. In 2009, Minnesota paved the way by becoming the first state to approve the education and licensing of dental therapists (DT). Research has shown dental therapists have expanded the access to dental care while providing high-quality and cost-effective care within tribal lands. (2) Similar results were found during the 1970s when US dental schools trained dental hygienists to perform restorative procedures. (3)(4)(5)(6) When the dental hygiene and assisting practice acts expanded during the 1990s and 2000s to include restorative expanded functions, investigations found allied providers to perform at acceptable levels and restorative outcomes were comparable to that of a dentist working in the same population. (6)

Despite research demonstrating the competence of both non-dentist providers and non-physician clinicians, such as nurse practitioners and physician assistants the introduction of the dental therapist in Minnesota has been surrounded by controversy. (7–11) The main argument being a dental therapist does not have the same level of education and therefore is less competent than a dentist when performing irreversible procedures.

(12) However, there have been no studies done evaluating the clinical competence of this new dental provider, as compared to a dentist.

## PURPOSE OF STUDY

The purpose of this study was to investigate the clinical competence of dental therapy students as compared to dental students in a U.S. dental school.

## STATEMENT OF THE PROBLEM

The growing trend of new dental provider, dental therapist, in the dental fields has received push back by the American Dental Association. The addition of a mid-level provider would allow dentists to perform more involved dental procedures and comprehensive evaluation while delegating simple restorations to a dental auxiliary. The idea of increasing access to care with the expansion of the dental workforce has been met with controversy. They are inquiries on the quality of care being completed by a mid-level provider, dental therapist, on the general public. The thought echoed from a 1970 JADA article reflects the view of dental therapists within the United States. (13) The application within a community setting with government reimbursement has a higher chance of providing a working environment for the mid-level provider than the private practice, as in the community programs within Canada.

However, even with clinical evidence spanning from the 1970s to the present day program at the University of Minnesota, the evidence of the quality of care performed by dental therapist compared to the dentist is an issue. Addressing the topic of clinical competency and decision-making skills will provide a body of knowledge toward the quality of care that patients receive from the new dental provider. This study can expand the field of dentistry while addressing the quality of care delivered by a dental therapist.

## SIGNIFICANCE OF STUDY

Despite the fact that restorative procedures performed by allied dental providers has been well documented in the literature as being performed to a similar level of a dentist, the introduction of dental therapy has been surrounded by controversy. (14) Those opposed to dental therapy contend these providers receive less training and therefore compromise the quality of care and put patients at risk.(15) A comparison of the dental therapy students' and dental students' performance of clinical procedures at the University of Minnesota may help address the concern over clinical competence and instill confidence in the professional community, as well as the public's. Additionally, establishing that the clinical competency of a dental therapist is equal to that of a dentist may encourage dentists to hire dental therapists resulting in increased oral health workforce.

## RESEARCH QUESTION

Is there a difference in dental therapy students' clinical competence as compared to dental students at the University of Minnesota?

## HYPOTHESIS

There is no difference in the clinical competency of dental therapy student verses dentals students as measured by performance on clinical assessments at the University of Minnesota.

# SECTION 2

## REVIEW OF THE RELATED LITURATURE

To keep costs down as well as to improve access to care, an increasing larger proportion of American patients are receiving healthcare services from nurse practitioners and physician assistants. This group of providers represents an integral and economically desirable component of the healthcare system with implications for cost effective, quality care. Both nurse practitioners and physician's assistants have comparable patient outcomes when they share the same authority, responsibilities, administrative requirements, and patient population as primary care physicians. (9)

The success within the medical field with the expansion of nurse practitioners and physician assistants providing care to increase medical access has driven the conversation toward the dental therapist role within the dental workforce. The literature supports the clinical performance of nurse practitioners and physician assistants to that of a primary care physician. The delegation of duties within the dental profession can build from the medical framework implementing the dental therapist to increase access to care while being cost-effective. The global literature supports the quality of care being delivered by a dental therapist to be at least equal to that of a dentist practicing within a similar population.

Kuo found the care provided by nurse practitioners was associated with lower hospitalization rates when compared with physician care. (15) Through the framework of the Affordable Care Act, the number of community health centers staffed by nurse practitioners, and physician assistants has increased and expanded access to care. During a five-year study, Kurtzman studied the quality of primary care services delivered by

nurse practitioners and physician's assistants and found the care provided comparable to physicians. (16) The literature also shows non-physician clinicians spend more time educating and counseling patients than did primary care physicians.(16)

The Surgeon General's report, Oral Heath in America, documented the lack of access to oral health care by many Americans.(1,17) The report led some to advocate for diversifying the types of dental providers (dental therapists, community dental health coordinator) or expanding the scopes of existing allied dental providers (dental assistants, dental hygienists). In order to ascertain the global impact of expanded function dental allied providers, as well as the new primary care dental provider labeled dental therapist, a search of the literature was conducted. Use of PubMed search engine through the University of Minnesota's Library found 508 articles containing information identifying the new primary care provider. Final journal selection was based on landmark studies and relevance to clinical competency and quality of care.

Allied Dental Providers with Expanded Functions

Expanding the scope of practice to include restorative procedures for allied dental providers is not new and expansion emerged in the 1960's in an effort to increase dental access. Throughout the past fifty years, evidence has consistently shown the quality of restorative procedures completed by allied dental providers is equal to that of a dentist. Worley et al. showed the treatment results of restorations placed by restorative function auxiliaries (RFAs) are comparable to that completed by a dentist. (18) The study concluded that the experience of the dental provider did not have an affect on the results. The RFAs in the study had four years of restorative experience prior to the study, where the average experience of the participating dentists was 26 years. (18)

Hammons et al., conducted an eight-month clinical trial evaluating the placement of restorative material by advanced trained dental hygienists to determine if the quality of care was similar to that of a dentist. The conclusion of the study determined that the placement of restorative material was done equally as well as a dentist. (3) The use of dental auxiliaries for the placement of restoration was also conducted in London, UK through the General Dental Council. The Forsyth experiment concluded the education of dental auxiliaries with the knowledge and instruction to proficiently place restoration was done in half the time as compared to formal training of a dentist without the loss in restoration quality. The advanced trained dental hygienist performed restorative dentistry equal in quality to practicing dentists working under the same restraints of quality control. (19) Numerous other studies came to the same conclusion; allied dental providers reduce cost, provided high quality care and do not put patients at risk. (2,3,18–26)

Post & Stoltenberg found that despite changes to the dental practice act in Minnesota, delegation of restorative procedures to dental assistants and dental hygienists remains low and has not expanded access to care in underserved populations. (27) One reason for this may be that a dentist still has to prepare the tooth, as dental assistants and hygienists are only allowed to place and carve restorative materials. To improve upon this model, and address the growing oral health disparity, Minnesota passed legislation in 2009 authorizing the education and licensing of dental therapists. At the time dental therapy was introduced in Minnesota, it was hypothesized dental therapists could provide most basic restorative care, allowing the dentist to perform more complex procedures. (28)

## Global Review of the Dental Therapist

Globally, the literature supports the fact that clinical competence of a practicing dental therapist is the same as an entry-level dentist within dental therapy scope of practice. The literature supports an increased in access to dental care, as well as improved oral health in school age children in New Zealand, Australia, the United Kingdom, and Canada through the utilization of Dental therapist. (1,5,29–31) Dental therapists have been evaluated and observed in numerous clinical trials and community programs to provide care at a level comparable to a practicing dentist. Phillips and Shaefer systematic review of the controversy over the dental therapy model concluded that dental therapist perform at an acceptable level. There dental therapy model was able to reduce cost and increase the number of provides improving access to care. (29) A study in the Netherlands concluded that the trained dental hygienist/therapist's work was equal to that of a dental student and perhaps better than the private practice dentists. (32) Trueblood found similar results after a ten-year study in Canada investigating dental services completed by dental therapists in Manitoba. Additionally, the findings suggested that the quality of services produced a positive outcome for the population served (5).

The literature also supports dental therapist's ability to perform safe treatment for an adult patient population of 26-years and older. Sheldon and Treasure found direct coronal restorations completed by a dental therapist had a 90% success rate. (33,34) Similarly, Calache et al., demonstrated that the direct coronal restorations were successfully completed with a 94.6% satisfactory rate. The clinical outcome was found to be similar to what was expected from a recently graduated dental student. (33)

England dental professional community has generally accepted England's inclusion of the dental therapist to the dental team as a survey conducted in 2003 reported

70% of the practitioners considered the DT a valued member of the dental team.(35) However, when first introduced in England, Sun and Harris found dentists thought a large number of dentists were needed to provide enough work for a DT. Dentists employing DT's reported they spent a majority of their time treatment planning in order to supply an adequate patient load for a DT limiting the time for complex work demanding a dentist's full range of skills.(35) In another study, Sun, Harris, and Burnside found patients expressed greater satisfaction in care that was delivered by a DT than a dentist. (36)

## Dental Therapy in the United States

Bader et al., conducted a long-term assessment of dental therapists operating in Alaska's native community. The investigators studied the Alaskan Dental Health Aid Therapist (DHAT) evaluating patient management, safety, and restoration placement and preparation over a five-year period. (2) The review was later repeated in 2009 and 2010 with dental examiners from the University of North Carolina. The technical care provided by dental therapists during these observations was found to equal the standard of care provided by a dental student. (2) Given the two earlier evaluations in 2003-2005 and 2008-2009, the investigators concluded that further review of the dental therapist in the United States should be shifted towards from focus of clinical performance towards effectiveness in improving the oral health of their target community. (2)

Supporting evidence can be found from the records audited by Bolin in 2008. Bolin reviewed clinical records of irreversible procedures completed by dentists and dental health aide therapists from five Alaskan dental health clinic that were apart of three different corporations. Upon review, there was no significant difference between

the care provided by the dental health aide therapist and the dentist providing similar irreversible treatment. (26)

Quality of care is an important outcome measure. Evidence attesting to the clinical competence of the dental therapist is needed to advance dental therapy and instill confidence within the professional community and society in general. No such comparison has been done since the introduction of dental therapy in Minnesota. The dental therapy program at the University of Minnesota provides a controlled environment for the testing of clinical performance between dental therapy and dental students on restorative and operative skills. Therefore, the purpose of this study is to compare the clinical competency between dental therapy and dental students educated at the University of Minnesota.

**SECTION 3**

## Synopsis

**Objective:** To determine if there is a difference between dental therapy students' clinical competence as compared to dental students at the University of Minnesota.

**Method:** An ex post facto research design was used to compare the clinical performance of dental therapy students and dental students using selected clinical procedures as a measure of clinical competence. Dental students and dental therapy students from the graduating classes of 2016 and 2017 at the University of Minnesota comprised the study sample. Fisher's exact test was used to compare pass rates, and Wilcox rank sum test was used to compare cohort groups.

**Results:** Dental therapy students' clinical performance on competency examinations, as well as scores on daily clinical procedures showed no statistically significant difference when compared to dental student performance. A small statistical difference was seen between the 2016 dental therapy and dental student performance score where the dental therapist student performed better than the dental students $p=0.0351$ ($p<0.05$).

**Conclusion:** There was no overall statistical difference in clinical performance between the two student cohorts. The dental therapist student performed equal as well as the dental students.

**MANUSCRIPT**

This manuscript will be submitted to the *Journal of Public Health Dentistry*.

Introduction and Literature Review

The Surgeon General's report in 2000 focused on the oral health in America, calling for the creation of an increased dental workforce to address America's growing oral health disparity.(17) The call for an increased healthcare workforce was later reinforced by the Affordable Care Act, which specifically stated support for the utilization of midlevel dental providers. The need for improved oral health care delivery in the United States resulted in the introduction of a new dental provider called a dental therapist. (1,17)

Dental therapists have been successful in providing dental care in New Zealand, Australia, the United Kingdom and Canada. Most of their work has been associated with school based dental programs that address the limited access to care. Their use within school programs within New Zealand has shown great success in reducing childhood dental disease while providing restorative care at comparable quality to that of a dentist. (37) The Alaska Dental Health Aide Therapist has been shown to provide irreversible dental procedure at the quality of a dentist under the same conditions. (2,26) The success of the Alaskan dental therapy program shifted the discussion clinical performance toward effectiveness of the dental therapist in a target population. However, the controversy on the quality of care being provided by the new dental provider remains at the forefront of the dental therapy expansion.

The controversy surrounding the dental therapy program has centers on irreversible dental procedures completed by non-dentist. The American Dental Association describes the increased usage of a new primary care provider, dental therapist, to complete restorations and extractions is not the solution towards reducing the population's need for services. (38) The application of dental therapists within a solo-dental practice that already applies the skills of expanded function dental hygienists provides a decrease in the ability to delegate duties to the dental therapist's full skill set. (4) However, the usage of the dental therapist to provide treatment planning, diagnostics, and irreversible dental procedures to reduce the caries increment and severity did not differ from that of a dentist. (14) A shift in the professional culture to increase the duties delegated to the dental therapist can provide a continued benefit for the population that they serve. (39)

The introduction of the dental therapy program at the University of Minnesota began in 2009. The current infrastructure of the school of dentistry provided a team environment where dental hygienists, dental therapists, and dental students are educated together to improve access to care, utilizing the current facilities and faculty. The educational goal of the program was to create dental professionals that mirrored the competency of the dental students. (40) However, to date the clinical performance of dental therapists in Minnesota has not been studied. Therefore, the purpose of this study was to compare the clinical performance of dental therapy students with dental students within an academic setting.

## Methods and Materials

This study was approved by the IRB at the University of Minnesota #00003284: An ex post facto research design was used to compare the clinical competence of dental therapy students vs. dental students at the University of Minnesota. The sample population included 109 final year dental students and eight final year dental therapy students from the class of 2016 and 108 final year dental students and seven final year dental therapy students from the class of 2017. A retrospective analysis of students' scores earned on selected clinical procedures was performed for the comparison of clinical competence. Secondary data was collected from the School of Dentistry's AxiUm software database, as well as student competency evaluation forms between January - May of 2018.

Clinical competency was determined by comparing the pass rate and number of attempts to successfully complete three operative competencies done in the Comprehensive Care Clinic (CCC) on adult patients. These three clinical skill assessment examinations were: 1) Class III anterior composite, 2) Posterior Class II composite, and 3) an Amalgam restoration. Both the preparation and the restoration were evaluated for all procedures. Additionally, four competencies examinations done in the pediatric clinic were compared: 1) diagnosis/treatment planning, 2) a special needs diagnostic and prevention/treatment planning, 3) a restorative I competency, and 4) a restorative II competency. Subjects were required to complete two different restorations within their pediatric population in order to complete the restorative 1 and restorative 2 competencies. Operative clinical competency examinations were graded pass or fail with two variations of passing scores. Students received an N (ideal treatment), S (deviations from ideal but

clinical accurate) or F (fail/ moderate or extreme deviations from ideal). The pediatric competencies were scored as pass or fail, where passing was an ideal and failing was a deviation from ideal.

Additionally, the annual cumulative performance of general dentistry procedures completed in the CCC during their final year (proximal anterior composites, proximal posterior composites, posterior composites and indirect restorations) was used to compare clinical competence between the two student groups. The overall performance score was generated from the mean preparation score, mean restorative score, and mean operative treatment skills score. Students performed all clinical competency examinations and clinical procedures under the supervision of dentist faculty members. All faculty were calibrated increasing the reliability of student evaluation over the comparison time frame. The clinical competency forms used to evaluate the performance for the students were the same during the 2016-2017-collection time frame (See Appendix C). Confidentiality was maintained by removing all student names and identifiers during the analysis.

Statistical Analysis. Descriptive statistics were used to summarize the data by year and program. Fisher's exact tests were used to compare passing rates on competency examinations between dental and dental therapy programs for each year. Wilcoxon rank sum tests were used to compare general clinical performance scores between programs for each year. P-values less than 0.05 were considered statistically significant. SAS V9.3 (SAS Institute Inc., Cary, NC) was used for the analysis.

## Results

Comparison of the student's adult and pediatric clinical competency examination scores showed no statistically significant finding. The dental therapy students performed equally as well as the dental students on both the operative competencies and pediatric competencies. (See Table 1)

An area of difference was found in the cumulative performance scores between the 2016 dental students and dental therapy students. The p-value from the Wilcoxon rank sum test for performance scores was 0.0351 ($p<0.05$) showed a smaller standard deviation within the dental therapy group with a mean performance score of 2.55 out of a 3-point scale. This difference indicated a better performance score for the dental students in the 2016 cohort over the dental therapy students. However, given the small class size of the dental therapy class, this finding should not be considered significant. Data supported the hypothesis that there is no difference in the clinical competency of a University of Minnesota dental therapy student verses a dental student as measured by performance on clinical examinations upon operative, restorative, and treatment planning competencies. (see Table 1)

## Discussion

This study sought to investigate the clinical competency of dental therapy students as compared to dental students at the University of Minnesota. The findings of this study support the hypothesis that a non-dentist, primary care dental provider could be educated to perform basic restorative procedures at the same level of competence as a dentist. These findings provide additional data that should dispel perceptions that the quality of care delivered by a dental therapist is inferior and puts patients at risk. (26)

Additionally, study results suggest Minnesota dentists should feel confident in hiring a dental therapist educated at the University of Minnesota.

Study results support the global and U.S. dental therapy literature. The global evaluation of technical performance of a dental therapist has been observed to be equal to that of dentist working under similar conditions. (41) Mathu-Muju in 2014 showed the ability of a dental therapist to perform irreversible clinical procedures at an acceptable level of technical quality. (42) Calache also found the care provided was similar to that of an entry-level dentist. (31) Similarly, Bader reported the Alaskan Dental Health Aid Therapist performed at a comparable level to a dentist treating the same population. (2)

The results of no difference in clinical performance can be attributed to the fact that dental therapy and dental students are educated together as members of the dental team within the Comprehensive Care Clinic. Both student cohorts are held to the same standard on clinical performance that should result in similar, if not the same, clinical competency.

The dental therapist model used in Minnesota was driven by the optimizing the dental team in order to provide a cost-effective way to increase access to care. Early evidence suggests dental therapist are expanding access to care in underserved areas. Blue and Kaylor found Minnesota dentists who employ dental therapists are allowing them to provide their full scope of practice indicating a high level of trust and acceptance. (17) They also found that dentist that utilize dental therapist within the dental team has shifted the role of the dentist. Dentists that employed a full-time dental therapist were performing more complex dental work outside of a dental therapist scope of practice. The dental therapist was providing most of the basic restorative care in the practice. (39)

There is every indication that the expansion of the dental therapist will follow the expansion of the medical field. It is not hard to see the parallels to the evolution of the nurse practitioner or physician's assistant and conclude that dental therapists will become an integral part of the oral health care system and will assist to redefine the way oral health care is delivered. Data from this study supports the expansion of the dental therapy education programs within a dental school setting, as it demonstrates dental therapy educational programs can provide the highly capable dental workforce the Surgeon General advocated for in his 2000 report on oral health in America. (17)

The limitation of this study is the difference in class size between the dental therapy students and the dental students. This study involved only two classes of dental and dental therapy students in one educational setting and therefore, results are not generalizable.

Future research will be needed to investigate dental therapists impact on expanding access to care, as well as their impact on oral health outcomes in the communities dental therapists serve.

## Conclusion

The results of this study found there is no difference in the clinical competence of dental therapy students vs. dental students. The care provided in the areas of treatment planning and therapeutic work was found to be of equal quality for adult and pediatric patients.

The evaluation of the dental therapist's within US dental schools extends back to the 1950s. The continued assessment of the US programs has demonstrated over the past

70 years that the training of allied providers can function at a safe and competent level. Future research should concentrate on the dental therapist's impact on the economy and community they serve, rather than their technical ability.

# SECTION 4

**Table 1:**
**DDS/DT clinical competency comparison 2016 and 2017**

| | 2016 | | | 2017 | | |
|---|---|---|---|---|---|---|
| | **DDS** | **DT** | **P-value**** | **DDS** | **DT** | **P-value**** |
| **Number of Students†** | 109 | 8 | | 113 | 7 | |
| | | | | | | |
| **Operative Competencies First Attempt Passing Rate, n (%)** | | | | | | |
| Class III Anterior | 106 (97.3) | 8 (100) | 1.0000 | 107 (99.1) | 6 (100) | 1.0000 |
| Class II Posterior | 108 (99.1) | 8 (100) | 1.0000 | 105 (97.2) | 6 (85.7) | 0.2248 |
| Amalgam | 104 (95.4) | 7 (87.5) | 0.3525 | 106 (98.2) | 6 (85.7) | 0.1731 |
| **Pediatric Competencies First Attempt Pass Rate, n (%)** | | | | | | |
| Diagnosis/Prevention Treatment Planning | 88 (80.7) | 7 (87.5) | 1.0000 | 87 (80.6) | 6 (85.7) | 1.0000 |
| Special Needs Treatment Planning | 92 (84.4) | 8 (100) | 0.6009 | 95 (88.0) | 6 (85.7) | 1.0000 |
| Restorative I | 101 (92.7) | 8 (100) | 1.0000 | 98 (90.7) | 5 (71.4) | 0.1562 |
| Restorative II | 101 (92.7) | 8 (100) | 1.0000 | 99 (92.5) | 7 (100) | 1.0000 |
| **General Performance Report** | 3 point system | | | 5 point system | | |
| Performance Score*, mean (SD) | 2.67 (0.15) | 2.55 (0.14) | 0.0351 | 3.90 (0.13) | 3.78 (0.23) | 0.2019 |

**Table 2: Table of Class III Anterior by Program 2016**

| | **Program (Program)** | | |
|---|---|---|---|
| | **DDS** | **DT** | |
| **Ideal** | 21 (19.27) | 8 (100.00) | |
| **Slight Deviation** | 85 (77.98) | 0 (0.00) | |
| **Failed 1st attempt, passing 2nd attempt** | 3 (2.75) | 0 (0.00) | |
| **Total** | 109 | 8 | |

| Table 3: Table of Class II Posterior by Program 2016 | | | |
|---|---|---|---|
| | Program (Program) | | |
| | DDS | DT | |
| **Ideal** | 16 (14.68) | 8 (100.00) | |
| **Slight Deviation** | 92 (84.40) | 0 0.00 | |
| **Failed 1st attempt** | 1 (0.92) | 0 0.00 | |
| **Total** | 109 | 8 | |

| Table 4: Table of Amalgam by Program 2016 | | | |
|---|---|---|---|
| | Program (Program) | | |
| | DDS | DT | |
| **Ideal** | 12 (11.01) | 7 (87.50) | |
| **Slight Deviation** | 92 (84.40) | 1 (12.50) | |
| **Failed 1st attempt** | 4 (3.67) | 0 0.00 | |
| **Failed 1st attempt, Ideal 2nd attempt** | 1 (0.92) | 0 0.00 | |
| **Total** | 109 | 8 | |

| Table 5: Table of Diagnosis Prevention Treatment Planning by Program 2016 | | | |
|---|---|---|---|
| | Program (Program) | | |
| | DDS | DT | |
| **Ideal** | 88 (80.73) | 7 (87.50) | |
| **Slight Deviation** | 19 (17.43) | 1 (12.50) | |
| **Failed 1st attempt** | 1 (0.92) | 0 0.00 | |
| **Failed 1st and 2nd attempt** | 1 (0.92) | 0 0.00 | |
| **Total** | 109 | 8 | |

| Table 6: Table of Special Needs Treatment Planning by Program 2016 | | | |
|---|---|---|---|
| | Program (Program) | | |
| | DDS | DT | |
| **Ideal** | 92 (84.40) | 8 (100.00) | |
| **Slight Deviation** | 17 (15.60) | 0 0.00 | |
| **Total** | 109 | 8 | |

| Table 7: Table of Restorative I by Program 2016 | | | |
|---|---|---|---|
| | Program (Program) | | |
| | DDS | DT | |
| **Ideal** | 101 (92.66) | 8 (100.00) | |
| **Slight Deviation** | 8 (7.34) | 0 0.00 | |
| **Total** | 109 | 8 | |

| Table 8: Table of Restorative II by Program 2016 | | | |
|---|---|---|---|
| | Program(Program) | | |
| | DDS | DT | |
| **Ideal** | 101 (92.66) | 8 (100.00) | |
| **Slight Deviation** | 7 (6.42) | 0 0.00 | |
| **Failed 1st attempt** | 1 (0.92) | 0 0.00 | |
| **Total** | 109 | 8 | |

| Table 9: Table of Class III Anterior by Program 2017 | | | |
|---|---|---|---|
| | Program (Program) | | |
| | DDS | DT | |
| **Missing data** | 5 (4.42) | 1 (14.29) | |
| **Ideal** | 13 (11.50) | 6 (85.71) | |
| **Slight Deviation** | 94 (83.19) | 0 0.00 | |
| **Failed 1st attempt** | 1 (0.88) | 0 0.00 | |
| **Total** | 113 | 7 | |

| Table 10: Table of Class II Posterior by Program 2017 | | | |
|---|---|---|---|
| | Program (Program) | | |
| | DDS | DT | |
| **Missing Data** | 5 (4.42) | 0 0.00 | |
| **Ideal** | 15 (13.27) | 6 (85.71) | |
| **Slight Deviation** | 90 (79.65) | 0 0.00 | |
| **Failed 1st attempt** | 2 (1.77) | 1 (14.29) | |
| **Failed 1st attempt, Ideal 2nd attempt** | 1 (0.88) | 0 0.00 | |
| **Total** | 113 | 7 | |

| Table 11: Table of Amalgam by Program 2017 | | | |
|---|---|---|---|
| | Program (Program) | | |
| | DDS | DT | |
| **Missing Data** | 5 (4.42) | 0 0.00 | |
| **Ideal** | 8 (7.08) | 6 (85.71) | |
| **Slight Deviation** | 98 (86.73) | 0 0.00 | |
| **Failed 1st attempt** | 1 (0.88) | 1 (14.29) | |
| **Failed 1st and 2nd attempt** | 1 (0.88) | 0 0.00 | |
| **Total** | 113 | 7 | |

| Table 12: Table of Diagnosis Prevention Treatment Planning by Program 2017 | | | |
|---|---|---|---|
| | Program (Program) | | |
| | DDS | DT | |
| **Missing Data** | 5 (4.42) | 0 0.00 | |
| **Ideal** | 87 (76.99) | 6 (85.71) | |
| **Slight Deviation** | 16 (14.16) | 1 (14.29) | |
| **Failed 1st attempt** | 5 (4.42) | 0 0.00 | |
| **Total** | 113 | 7 | |

| Table 13: Table of Restorative I by Program 2017 | | | |
|---|---|---|---|
| | Program (Program) | | |
| | DDS | DT | |
| **Missing Data** | 5 (4.42) | 0 0.00 | |
| **Ideal** | 98 (86.73) | 5 (71.43) | |
| **Slight Deviation** | 7 (6.19) | 2 (28.57) | |
| **Failed 1st attempt** | 3 (2.65) | 0 0.00 | |
| **Total** | 113 | 7 | |

| Table 14: Table of Restorative II by Program 2017 | | | |
|---|---|---|---|
| | Program (Program) | | |
| | DDS | DT | |
| **Missing Data** | 5 (4.42) | 0 0.00 | |
| **Ideal** | 99 (87.61) | 7 (100.00) | |
| **Slight Deviation** | 8 (7.08) | 0 0.00 | |
| **Total** | 113 | 7 | |

# SECTION 5

## Practical Application

The University of Minnesota can be confident that the graduates of the dental therapy program are competent clinicians. The data collected from the two cohorts group showed that the performance levels of dental therapy and dental students are similar if not equal. The results of this study should dispel concerns about the dental therapists' education and their ability to provide quality care. The professional community, as well as the public, should be confident the newest member of the dental team is well educated, clinically competent and do not pose any risk to patients.

# SECTION 6

Appendix A: Comprehensive list of References


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Appendix B: IRB letter

May 4, 2018

Christine Blue

612-625-5954 bluex005@umn.edu

EXEMPTION DETERMINATION

Dear Christine Blue:
On 5/4/2018, the IRB reviewed the following submission:

| | |
|---|---|
| Type of Review: | Initial Study |
| Title of Study: | A comparison of the clinical competence of dental therapy and dental students at the University of Minnesota. |
| Investigator: | Christine Blue |
| IRB ID: | STUDY00003284 |
| Sponsored Funding: | None |
| Grant ID/Con Number: | None |
| Internal UMN Funding: | None |
| Fund Management Outside University: | None |
| IND, IDE, or HDE: | None |
| Documents Reviewed with this Submission: | • Mancini_data-or-specimen-only-protocol.docx, Category: IRB Protocol; |

The IRB determined that this study meets the criteria for exemption from IRB review. To arrive at this determination, the IRB used "WORKSHEET: Exemption (HRP-312)." If you have any questions about this determination, please review that Worksheet in the HRPP Toolkit Library and contact the IRB office if needed.

This study met the following category for exemption:

• (4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects. (For research conducted, funded, or otherwise subject to regulation by any federal agency "existing" means "existing at the time the research is proposed." Otherwise, it means "existing at the time the research is proposed or will exist in the future for non-research purposes")

Ongoing IRB review and approval for this study is not required; however, this determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about

whether these activities impact the exempt determination, please submit a Modification to the IRB for a determination.

In conducting this study, you are required to follow the requirements listed in the Investigator Manual (HRP-103), which can be found by navigating to the HRPP Toolkit Library on the IRB website.

For grant certification purposes, you will need these dates and the Assurance of Compliance number which is FWA00000312 (Fairview Health Systems Research FWA00000325, Gillette Children's Specialty Healthcare FWA00004003).

Sincerely,

Jeffery P Perkey, CIP, MLS IRB Analyst

We value feedback from the research community and would like to hear about your experience. The link below will take you to a brief survey that will take a minute or two to complete. The questions are basic, but your responses will help us better understand what we are doing well and areas that may require improvement. Thank you in advance for completing the survey.

Even if you have provided feedback in the past, we want and welcome your evaluation.

https://umn.qualtrics.com/SE/?SID=SV_5BiYrqPNMJRQSBn

Appendix C: Clinical Evaluation form.

Student Name_____ Patient Name_____ Date_____

STUDENT SELF-EVALUATION

**Posterior Composite Cavity Preparation**
**Areas Evaluated and Associated Criteria**

| Evaluation | N<br>Ideal | S<br>Deviations from ideal but clinically acceptable | M/E<br>Moderate/extensive deviations from ideal/clinically unacceptable |
|---|---|---|---|
| **Posterior Composite Cavity Preparation** | | | |
| **Carious Tissue Removal** | ☐ Carious tissue & existing restorative materials are completely removed in a conservative fashion | ☐ Slightly questionable area remains | ☐ Soft dentin, DEJ staining, or existing restorative material remains |
| **Outline Form** | ☐ Smooth, flowing outline, terminates on sound tooth structure | ☐ Outline irregular or angular, margins terminate in surface stain or calculus | ☐ Outline terminates in significant decalcification or existing restorations |
| **Extensions** | ☐ Extensions conserve tooth structure yet provide access | ☐ Slightly over- or under-extended | ☐ Decidedly over- or underextended |
| **Depth** | ☐ Depth minimizes pulpal trauma, maximizes retention | ☐ Slightly too deep or too shallow pulpally or axially | ☐ Decidedly too deep or too shallow pulpally or axially<br>☐ Mechanical pulp exposure |
| **Retention/ Resistance Form** | ☐ Walls provide retention and resistance form | ☐ Walls deviate slightly from ideal retention or resistance form | ☐ Walls deviate significantly from ideal retention or resistance form |
| **Cavity Refinement** | ☐ Smooth walls, well defined cavosurface margins | ☐ Small areas of roughness in walls or on margins | ☐ Generally rough walls or poorly defined margins |
| **Tissue Preservation** | ☐ Adjacent teeth restorations and soft tissues are preserved intact | ☐ Slight alteration of anatomic form of adjacent teeth, restorations or soft tissues | ☐ Damage to adjacent teeth, restorations or soft tissues<br>☐ Preparation of unassigned tooth or surfaces |
| **Rubber Dam Isolation, Cleanliness** | ☐ Clean preparation, well isolated, protecting soft tissues | ☐ Slight leakage or minor debris in non-critical area | ☐ Blood, saliva, debris in preparation<br>☐ Liner or base on cavosurface margin<br>☐ No rubber dam |

Student Name_____ Patient Name_____ Date_____

Evaluation in the gray area for any criteria will result in a failure of the competency exam.

# FACULTY #1 EVALUATION

## Posterior Composite Preparation Competency
## Areas Evaluated and Associated Criteria

| Evaluation | N<br>Ideal | S<br>Deviations from ideal but clinically acceptable | M/E<br>Moderate/extensive deviations from ideal/clinically unacceptable |
|---|---|---|---|
| **Posterior Composite Cavity Preparation** | | | |
| **Carious Tissue Removal** | ☐ Carious tissue & existing restorative materials are completely removed in a conservative fashion | ☐ Slightly questionable area remains | ☐ Soft dentin, DEJ staining, or existing restorative material remains |
| **Outline Form** | ☐ Smooth, flowing outline, terminates on sound tooth structure | ☐ Outline irregular or angular, margins terminate in surface stain or calculus | ☐ Outline terminates in significant decalcification or existing restorations |
| **Extensions** | ☐ Extensions conserve tooth structure yet provide access | ☐ Slightly over- or under-extended | ☐ Decidedly over- or underextended |
| **Depth** | ☐ Depth minimizes pulpal trauma, maximizes retention | ☐ Slightly too deep or too shallow pulpally or axially | ☐ Decidedly too deep or too shallow pulpally or axially<br>☐ Mechanical pulp exposure |
| **Retention/ Resistance Form** | ☐ Walls provide retention and resistance form | ☐ Walls deviate slightly from ideal retention or resistance form | ☐ Walls deviate significantly from ideal retention or resistance form |
| **Cavity Refinement** | ☐ Smooth walls, well defined cavosurface margins | ☐ Small areas of roughness in walls or on margins | ☐ Generally rough walls or poorly defined margins |
| **Tissue Preservation** | ☐ Adjacent teeth restorations and soft tissues are preserved intact | ☐ Slight alteration of anatomic form of adjacent teeth, restorations or soft tissues | ☐ Damage to adjacent teeth, restorations or soft tissues<br>☐ Preparation of unassigned tooth or surfaces |
| **Rubber Dam Isolation, Cleanliness** | ☐ Clean preparation, well isolated, protecting soft tissues | ☐ Slight leakage or minor debris in non-critical area | ☐ Blood, saliva, debris in preparation<br>☐ Liner or base on cavosurface margin<br>☐ No rubber dam |

Faculty Initials_____ID #_____ Date_____

Student Name_____ Patient Name_____ Date_____

Evaluation in the gray area for any criteria will result in a failure of the competency exam.

# FACULTY #2 EVALUATION

## Posterior Composite Preparation Competency
## Areas Evaluated and Associated Criteria

| Evaluation | N<br>Ideal | S<br>Deviations from ideal but clinically acceptable | M/E<br>Moderate/extensive deviations from ideal/clinically unacceptable |
|---|---|---|---|
| **Posterior Composite Cavity Preparation** | | | |
| **Carious Tissue Removal** | ☐ Carious tissue & existing restorative materials are completely removed in a conservative fashion | ☐ Slightly questionable area remains | ☐ Soft dentin, DEJ staining, or existing restorative material remains |
| **Outline Form** | ☐ Smooth, flowing outline, terminates on sound tooth structure | ☐ Outline irregular or angular, margins terminate in surface stain or calculus | ☐ Outline terminates in significant decalcification or existing restorations |
| **Extensions** | ☐ Extensions conserve tooth structure yet provide access | ☐ Slightly over- or under-extended | ☐ Decidedly over- or underextended |
| **Depth** | ☐ Depth minimizes pulpal trauma, maximizes retention | ☐ Slightly too deep or too shallow pulpally or axially | ☐ Decidedly too deep or too shallow pulpally or axially<br>☐ Mechanical pulp exposure |
| **Retention/ Resistance Form** | ☐ Walls provide retention and resistance form | ☐ Walls deviate slightly from ideal retention or resistance form | ☐ Walls deviate significantly from ideal retention or resistance form |
| **Cavity Refinement** | ☐ Smooth walls, well defined cavosurface margins | ☐ Small areas of roughness in walls or on margins | ☐ Generally rough walls or poorly defined margins |
| **Tissue Preservation** | ☐ Adjacent teeth restorations and soft tissues are preserved intact | ☐ Slight alteration of anatomic form of adjacent teeth, restorations or soft tissues | ☐ Damage to adjacent teeth, restorations or soft tissues<br>☐ Preparation of unassigned tooth or surfaces |
| **Rubber Dam Isolation, Cleanliness** | ☐ Clean preparation, well isolated, protecting soft tissues | ☐ Slight leakage or minor debris in non-critical area | ☐ Blood, saliva, debris in preparation<br>☐ Liner or base on cavosurface margin<br>☐ No rubber dam |

Faculty Initials_____ID #_____ Date_____

Student Name_____ Patient Name_____ Date_____

STUDENT SELF-EVALUATION

## Posterior Composite Restoration
## Areas Evaluated and Associated Criteria

| Evaluation | N<br>Ideal | S<br>Deviations from ideal but clinically acceptable | M/E<br>Moderate/extensive deviations from ideal/clinically unacceptable |
|---|---|---|---|
| **Posterior Composite Restoration** | | | |
| **Surface Quality** | ☐ Excellent Surface uniformly smooth | ☐ Slight roughness in small areas | ☐ Generally rough, irregular, pitted<br>☐ Restoration cracked |
| **Margin Integrity** | ☐ Excellent margins, nearly undetectable with sharp explorer | ☐ Slight detectable margins but closed | ☐ Pronounced marginal discrepancy (open, excess, deficient) |
| **Anatomy/ Contour** | ☐ Embrasures are hygienic and in harmony with natural tooth | ☐ Slightly over- or under-contoured | ☐ Decidedly over- or under-contoured<br>☐ Gross tooth reduction during polishing |
| **Proximal Contact** | ☐ Visually closed and smooth, resists unwaxed floss | ☐ Visually closed but light resistance to unwaxed floss<br>☐ Shreds with unwaxed floss but smooth to waxed floss | ☐ No resistance to shim stock or unwaxed floss<br>☐ Cannot floss through, floss breaks<br>☐ Visually open |
| **Function** | ☐ Occlusion is in harmony with centric and excursive movements | ☐ Slightly heavy occlusal contacts | ☐ Traumatic occlusion<br>☐ No occlusal function where indicated<br>☐ Fractured, loose or missing restoration |

Student Name_____ Patient Name_____ Date_____

Evaluation in the gray area for any criteria will result in a failure of the competency exam.

# FACULTY #1 EVALUATION

## Posterior Composite Restoration Competency
## Areas Evaluated and Associated Criteria

| Evaluation | N<br>Ideal | S<br>Deviations from ideal but clinically acceptable | M/E<br>Moderate/extensive deviations from ideal/clinically unacceptable |
|---|---|---|---|
| **Posterior Composite Restoration** | | | |
| **Surface Quality** | ☐ Excellent Surface uniformly smooth | ☐ Slight roughness in small areas | ☐ Generally rough, irregular, pitted<br>☐ Restoration cracked |
| **Margin Integrity** | ☐ Excellent margins, nearly undetectable with sharp explorer | ☐ Slight detectable margins but closed | ☐ Pronounced marginal discrepancy (open, excess, deficient) |
| **Anatomy/ Contour** | ☐ Embrasures are hygienic and in harmony with natural tooth | ☐ Slightly over- or under-contoured | ☐ Decidedly over- or under-contoured<br>☐ Gross tooth reduction during polishing |
| **Proximal Contact** | ☐ Visually closed and smooth, resists unwaxed floss | ☐ Visually closed but light resistance to unwaxed floss<br>☐ Shreds with unwaxed floss but smooth to waxed floss | ☐ No resistance to shim stock or unwaxed floss<br>☐ Cannot floss through, floss breaks<br>☐ Visually open |
| **Function** | ☐ Occlusion is in harmony with centric and excursive movements | ☐ Slightly heavy occlusal contacts | ☐ Traumatic occlusion<br>☐ No occlusal function where indicated<br>☐ Fractured, loose or missing restoration |

**Additional Comments:**

Faculty Initials_____ID #_____ Date_____

Student Name_____ Patient Name_____ Date_____

Evaluation in the gray area for any criteria will result in a failure of the competency exam.

## FACULTY #2 EVALUATION

### Posterior Composite Restoration Competency
### Areas Evaluated and Associated Criteria

| Evaluation | N<br>Ideal | S<br>Deviations from ideal but clinically acceptable | M/E<br>Moderate/extensive deviations from ideal/clinically unacceptable |
|---|---|---|---|
| **Posterior Composite Restoration** | | | |
| **Surface Quality** | ☐ Excellent Surface uniformly smooth | ☐ Slight roughness in small areas | ☐ Generally rough, irregular, pitted<br>☐ Restoration cracked |
| **Margin Integrity** | ☐ Excellent margins, nearly undetectable with sharp explorer | ☐ Slight detectable margins but closed | ☐ Pronounced marginal discrepancy (open, excess, deficient) |
| **Anatomy/ Contour** | ☐ Embrasures are hygienic and in harmony with natural tooth | ☐ Slightly over- or under-contoured | ☐ Decidedly over- or under-contoured<br>☐ Gross tooth reduction during polishing |
| **Proximal Contact** | ☐ Visually closed and smooth, resists unwaxed floss | ☐ Visually closed but light resistance to unwaxed floss<br>☐ Shreds with unwaxed floss but smooth to waxed floss | ☐ No resistance to shim stock or unwaxed floss<br>☐ Cannot floss through, floss breaks<br>☐ Visually open |
| **Function** | ☐ Occlusion is in harmony with centric and excursive movements | ☐ Slightly heavy occlusal contacts | ☐ Traumatic occlusion<br>☐ No occlusal function where indicated<br>☐ Fractured, loose or missing restoration |

**Additional Comments:**

Faculty Initials_____ ID #_____ Date_____ 7

# AMALGAM Preparation and Carving
# Clinical Competency Exam

Note: Preparation must involve a proximal contact and tooth must be vital and in occlusion

| Chart # | Patient Last Name | Student Last Name & Initial | Student ID # |
|---|---|---|---|
| Date | Time | Print Supervising Faculty Last Name & # | Location |

| Tooth # | Eligibility Verified | Planned Alterations Approved | Restoration Complete | Consensus Preparation Grade: ☐ N ☐ S ☐ M/E |
|---|---|---|---|---|
| Surface(s) M O/I D F L | Approval to Start | Caries Tissue Removal | Restoration / Procedure Status (select one) ☐ carved ☐ polished/ complete ☐ temporized ☐ incomplete | Consensus Restoration Grade: ☐ N ☐ S ☐ M/E |
| ADA Code | Rubber Dam Check | Preparation Complete | Faculty_____ID#_____ | Overall Exam Grade*: ☐ N ☐ S ☐ M/E |

*=lower of the two consensus grades for preparation & restoration

## Encounter Competency Evaluation (check where improvement needed)

**General Clinical Skills**
- ☐ Awareness of Medical Conditions
- ☐ Awareness of Occlusion
- ☐ Awareness of Periodontal Support
- ☐ Awareness of Pulp Health
- ☐ Awareness of Tx Plan / Sequence
- ☐ Professionalism
- ☐ Patient Rapport
- ☐ Clinical Judgment

**Operative Treatment Skills**
- ☐ Instrument Selection/Neatness
- ☐ Infection Control
- ☐ Recordkeeping
- ☐ Presentation to Instructor
- ☐ Patient Operator Positioning
- ☐ Isolation
- ☐ Local Anesthesia, Infiltration
- ☐ Local Anesthesia, Block
- ☐ Time Management

**Tooth Preparation Skills**
- ☐ Lesion Access
- ☐ Carious Tissue Removal
- ☐ Restorative Material Removal
- ☐ Preparation Design
- ☐ Pulp Protection
- ☐ Preparation Finish
- ☐ Tissue Management

**Restoration Skills**
- ☐ Material Handling
- ☐ Matrix & Wedging
- ☐ Contours
- ☐ Occlusion
- ☐ Proximal Contact
- ☐ Surface & Subsurface Quality
- ☐ Margin Quality

V. 10.24.07
20% gray

Student Name_____ Patient Name_____ Date_____

**STUDENT SELF-EVALUATION**

# Amalgam Cavity Preparation
## Areas Evaluated and Associated Criteria

| Evaluation | N<br>Ideal | S<br>Deviations from ideal but clinically acceptable | M/E<br>Moderate/extensive deviations from ideal/clinically unacceptable |
|---|---|---|---|
| **Amalgam Cavity Preparation** | | | |
| **Carious Tissue Removal** | ☐ Carious tissue & existing restorative materials are completely removed in a conservative fashion | ☐ Slightly questionable area remains | ☐ Soft dentin, DEJ staining, or existing restorative material remains |
| **Outline Form** | ☐ Smooth, flowing outline, terminates on sound tooth structure | ☐ Outline irregular or margins terminate in stain or calculus | ☐ Outline terminates in pits, fissures, decalcification or existing restorations |
| **Extensions** | ☐ Extensions conserve tooth structure yet provide access | ☐ Slightly over- or under-extended | ☐ Decidedly over- or underextended |
| **Depth** | ☐ Depth minimizes pulpal trauma, maximizes retention | ☐ Slightly irregular, too deep or too shallow pulpally or axially | ☐ Decidedly too deep or too shallow pulpally or axially<br>☐ Mechanical pulp exposure |
| **Retention/ Resistance Form** | ☐ Walls provide retention and resistance form | ☐ Walls deviate slightly from ideal retention or resistance form | ☐ Undermined enamel or walls decidedly too divergent or flared |
| **Cavity Refinement** | ☐ Smooth walls, well defined line angles & cavosurface margins | ☐ Small areas of roughness in walls, line angles or margins | ☐ Generally rough or poorly defined walls, line angles, or margins |
| **Tissue Preservation** | ☐ Adjacent teeth restorations and soft tissues are preserved intact | ☐ Slight alteration of anatomic form of adjacent teeth, restorations or soft tissues | ☐ Damage to adjacent teeth, restorations or soft tissues<br>☐ Preparation of unassigned tooth or surfaces |
| **Rubber Dam Isolation, Cleanliness** | ☐ Clean preparation, well isolated, protecting soft tissues | ☐ Slight leakage or minor debris in non-critical area | ☐ Blood, saliva, debris in preparation<br>☐ Liner or base on cavosurface margin<br>☐ No rubber dam |

Student Name_____ Patient Name_____ Date_____

Evaluation in the gray area for any criteria will result in a failure of the competency exam.

# FACULTY #1 EVALUATION

## Amalgam Preparation Competency
## Areas Evaluated and Associated Criteria

| Evaluation | N<br>Ideal | S<br>Deviations from ideal but clinically acceptable | M/E<br>Moderate/extensive deviations from ideal/clinically unacceptable |
|---|---|---|---|
| **Amalgam Cavity Preparation** | | | |
| **Carious Tissue Removal** | ☐ Carious tissue & existing restorative materials are completely removed in a conservative fashion | ☐ Slightly questionable area remains | ☐ Soft dentin, DEJ staining, or existing restorative material remains |
| **Outline Form** | ☐ Smooth, flowing outline, terminates on sound tooth structure | ☐ Outline irregular or margins terminate in stain or calculus | ☐ Outline terminates in pits, fissures, decalcification or existing restorations |
| **Extensions** | ☐ Extensions conserve tooth structure yet provide access | ☐ Slightly over- or under-extended | ☐ Decidedly over- or underextended |
| **Depth** | ☐ Depth minimizes pulpal trauma, maximizes retention | ☐ Slightly irregular, too deep or too shallow pulpally or axially | ☐ Decidedly too deep or too shallow pulpally or axially<br>☐ Mechanical pulp exposure |
| **Retention/ Resistance Form** | ☐ Walls provide retention and resistance form | ☐ Walls deviate slightly from ideal retention or resistance form | ☐ Undermined enamel or walls decidedly too divergent or flared |
| **Cavity Refinement** | ☐ Smooth walls, well defined line angles & cavosurface margins | ☐ Small areas of roughness in walls, line angles or margins | ☐ Generally rough or poorly defined walls, line angles, or margins |
| **Tissue Preservation** | ☐ Adjacent teeth restorations and soft tissues are preserved intact | ☐ Slight alteration of anatomic form of adjacent teeth, restorations or soft tissues | ☐ Damage to adjacent teeth, restorations or soft tissues<br>☐ Preparation of unassigned tooth or surfaces |
| **Rubber Dam Isolation, Cleanliness** | ☐ Clean preparation, well isolated, protecting soft tissues | ☐ Slight leakage or minor debris in non-critical area | ☐ Blood, saliva, debris in preparation<br>☐ Liner or base on cavosurface margin<br>☐ No rubber dam |

Faculty Initials_____ID #_____ Date_____

Student Name_____ Patient Name_____ Date_____

Evaluation in the gray area for any criteria will result in a failure of the competency exam.

# FACULTY #2 EVALUATION

## Amalgam Preparation Competency
## Areas Evaluated and Associated Criteria

| Evaluation | N<br>Ideal | S<br>Deviations from ideal but clinically acceptable | M/E<br>Moderate/extensive deviations from ideal/clinically unacceptable |
|---|---|---|---|
| **Amalgam Cavity Preparation** | | | |
| **Carious Tissue Removal** | ☐ Carious tissue & existing restorative materials are completely removed in a conservative fashion | ☐ Slightly questionable area remains | ☐ Soft dentin, DEJ staining, or existing restorative material remains |
| **Outline Form** | ☐ Smooth, flowing outline, terminates on sound tooth structure | ☐ Outline irregular or margins terminate in stain or calculus | ☐ Outline terminates in pits, fissures, decalcification or existing restorations |
| **Extensions** | ☐ Extensions conserve tooth structure yet provide access | ☐ Slightly over- or under-extended | ☐ Decidedly over- or underextended |
| **Depth** | ☐ Depth minimizes pulpal trauma, maximizes retention | ☐ Slightly irregular, too deep or too shallow pulpally or axially | ☐ Decidedly too deep or too shallow pulpally or axially<br>☐ Mechanical pulp exposure |
| **Retention/ Resistance Form** | ☐ Walls provide retention and resistance form | ☐ Walls deviate slightly from ideal retention or resistance form | ☐ Undermined enamel or walls decidedly too divergent or flared |
| **Cavity Refinement** | ☐ Smooth walls, well defined line angles & cavosurface margins | ☐ Small areas of roughness in walls, line angles or margins | ☐ Generally rough or poorly defined walls, line angles, or margins |
| **Tissue Preservation** | ☐ Adjacent teeth restorations and soft tissues are preserved intact | ☐ Slight alteration of anatomic form of adjacent teeth, restorations or soft tissues | ☐ Damage to adjacent teeth, restorations or soft tissues<br>☐ Preparation of unassigned tooth or surfaces |
| **Rubber Dam Isolation, Cleanliness** | ☐ Clean preparation, well isolated, protecting soft tissues | ☐ Slight leakage or minor debris in non-critical area | ☐ Blood, saliva, debris in preparation<br>☐ Liner or base on cavosurface margin<br>☐ No rubber dam |

Faculty Initials_____ ID #_____ Date_____ 4

Student Name_____ Patient Name_____ Date_____

STUDENT SELF-EVALUATION

## Carved Amalgam Restoration
## Areas Evaluated and Associated Criteria

| Evaluation | N<br>Ideal | S<br>Deviations from ideal but clinically acceptable | M/E<br>Moderate/extensive deviations from ideal/clinically unacceptable |
|---|---|---|---|
| **Carved Amalgam Restoration** | | | |
| **Surface Quality** | ☐ Excellent Surface uniformly smooth | ☐ Slight roughness in small areas | ☐ Generally rough, irregular, pitted<br>☐ Restoration cracked |
| **Margin Integrity** | ☐ Excellent margins | ☐ Slight marginal discrepancy but closed | ☐ Pronounced marginal discrepancy (open, excess, deficient) |
| **Axial Contour** | ☐ Embrasures are hygienic and in harmony with natural tooth | ☐ Slightly over- or under-contoured | ☐ Decidedly over- or under-contoured<br>☐ Gross tooth reduction during carving |
| **Proximal Contact** | ☐ Visually closed and smooth, resists unwaxed floss | ☐ Visually closed but light resistance to unwaxed floss<br>☐ Shreds with unwaxed floss but smooth to waxed floss | ☐ No resistance to shim stock or unwaxed floss<br>☐ Cannot floss through, floss breaks<br>☐ Visually open |
| **Occlusal Anatomy** | ☐ Ridges, grooves, fossae are defined and harmonious | ☐ Anatomy is slightly lacking definition or harmony | ☐ Anatomy decidedly lacks definition, or harmony, or is too deep/ shallow<br>☐ Gross lack of anatomic form or gross tooth reduction |
| **Function** | ☐ Occlusion is in harmony with centric and excursive movements | ☐ Slightly heavy occlusal contacts | ☐ Traumatic occlusion<br>☐ No occlusal function where indicated<br>☐ Fractured, loose or missing restoration |

Student Name_____ Patient Name_____ Date_____

Evaluation in the gray area for any criteria will result in a failure of the competency exam.

# FACULTY #1 EVALUATION

## Carved Amalgam Restoration Competency
## Areas Evaluated and Associated Criteria

| Evaluation | N<br>Ideal | S<br>Deviations from ideal but clinically acceptable | M/E<br>Moderate/extensive deviations from ideal/clinically unacceptable |
|---|---|---|---|
| **Carved Amalgam Restoration** | | | |
| **Surface Quality** | ☐ Excellent Surface uniformly smooth | ☐ Slight roughness in small areas | ☐ Generally rough, irregular, pitted<br>☐ Restoration cracked |
| **Margin Integrity** | ☐ Excellent margins | ☐ Slight marginal discrepancy but closed | ☐ Pronounced marginal discrepancy (open, excess, deficient) |
| **Axial Contour** | ☐ Embrasures are hygienic and in harmony with natural tooth | ☐ Slightly over- or under-contoured | ☐ Decidedly over- or under-contoured<br>☐ Gross tooth reduction during carving |
| **Proximal Contact** | ☐ Visually closed and smooth, resists unwaxed floss | ☐ Visually closed but light resistance to unwaxed floss<br>☐ Shreds with unwaxed floss but smooth to waxed floss | ☐ No resistance to shim stock or unwaxed floss<br>☐ Cannot floss through, floss breaks<br>☐ Visually open |
| **Occlusal Anatomy** | ☐ Ridges, grooves, fossae are defined and harmonious | ☐ Anatomy is slightly lacking definition or harmony | ☐ Anatomy decidedly lacks definition, or harmony, or is too deep/ shallow<br>☐ Gross lack of anatomic form or gross tooth reduction |
| **Function** | ☐ Occlusion is in harmony with centric and excursive movements | ☐ Slightly heavy occlusal contacts | ☐ Traumatic occlusion<br>☐ No occlusal function where indicated<br>☐ Fractured, loose or missing restoration |

**Additional Comments:**

Faculty Initials_____ ID #_____ Date_____

# ANTERIOR COMPOSITE Preparation and Restoration Clinical Competency Exam

Note: Preparation must involve a proximal contact and tooth must be vital and in occlusion

| Chart # | Patient Last Name | Student Last Name & Initial | Student ID # |
|---|---|---|---|
| Date | Time | Print Supervising Faculty Last Name & # | Location |

| Tooth # | Eligibility Verified | Planned Alterations Approved | Restoration Complete | Consensus Preparation Grade: ☐ N ☐ S ☐ M/E |
|---|---|---|---|---|
| Surface(s) M O/I D F L | Approval to Start | Caries Tissue Removal | Restoration / Procedure Status (select one) ☐ polished/ complete ☐ temporized ☐ incomplete | Consensus Restoration Grade: ☐ N ☐ S ☐ M/E |
| ADA Code | Rubber Dam Check | Preparation Complete | Faculty_____ID#_____ | Overall Exam Grade*: ☐ N ☐ S ☐ M/E |

*=lower of the two consensus grades for preparation & restoration

## Encounter Competency Evaluation (check where improvement needed)

**General Clinical Skills**
- ☐ Awareness of Medical Conditions
- ☐ Awareness of Occlusion
- ☐ Awareness of Periodontal Support
- ☐ Awareness of Pulp Health
- ☐ Awareness of Tx Plan / Sequence
- ☐ Professionalism
- ☐ Patient Rapport
- ☐ Clinical Judgment

**Operative Treatment Skills**
- ☐ Instrument Selection/Neatness
- ☐ Infection Control
- ☐ Recordkeeping
- ☐ Presentation to Instructor
- ☐ Patient Operator Positioning
- ☐ Isolation
- ☐ Local Anesthesia, Infiltration
- ☐ Local Anesthesia, Block
- ☐ Time Management

**Tooth Preparation Skills**
- ☐ Lesion Access
- ☐ Carious Tissue Removal
- ☐ Restorative Material Removal
- ☐ Preparation Design
- ☐ Pulp Protection
- ☐ Preparation Finish
- ☐ Tissue Management

**Restoration Skills**
- ☐ Material Handling
- ☐ Matrix & Wedging
- ☐ Contours
- ☐ Occlusion
- ☐ Proximal Contact
- ☐ Surface & Subsurface Quality
- ☐ Esthetics Maintained
- ☐ Margin Quality

V. 10.24.07
20% gray

Student Name_____ Patient Name_____ Date_____

# STUDENT SELF-EVALUATION

## Anterior Composite Cavity Preparation
## Areas Evaluated and Associated Criteria

| Evaluation | N<br>Ideal | S<br>Deviations from ideal but clinically acceptable | M/E<br>Moderate/extensive deviations from ideal/clinically unacceptable |
|---|---|---|---|
| **Anterior Composite Cavity Preparation** | | | |
| **Carious Tissue Removal** | ☐ Carious tissue & existing restorative materials are completely removed in a conservative fashion | ☐ Slightly questionable area remains | ☐ Soft dentin, DEJ staining, or existing restorative material remains |
| **Outline Form** | ☐ Smooth, flowing outline, terminates on sound tooth structure | ☐ Outline irregular or margins terminate in stain or calculus | ☐ Outline terminates in pits, fissures, decalcification or existing restorations |
| **Extensions** | ☐ Extensions conserve tooth structure yet provide access | ☐ Slightly over- or under-extended | ☐ Decidedly over- or underextended |
| **Depth** | ☐ Depth minimizes pulpal trauma, maximizes retention | ☐ Slightly irregular, too deep or too shallow pulpally or axially | ☐ Decidedly too deep or too shallow pulpally or axially<br>☐ Mechanical pulp exposure |
| **Resistance Form** | ☐ Walls provide resistance form | ☐ Walls deviate slightly from ideal resistance form | ☐ Walls deviate significantly from ideal resistance form |
| **Cavity Refinement** | ☐ Smooth walls, well defined cavosurface margins & bevels | ☐ Small areas of roughness in walls, margins, or bevels | ☐ Generally rough or poorly defined walls, margins, or bevels |
| **Tissue Preservation** | ☐ Adjacent teeth restorations and soft tissues are preserved intact | ☐ Slight alteration of anatomic form of adjacent teeth, restorations or soft tissues | ☐ Damage to adjacent teeth, restorations or soft tissues<br>☐ Preparation of unassigned tooth or surfaces |
| **Rubber Dam Isolation, Cleanliness** | ☐ Clean preparation, well isolated, protecting soft tissues | ☐ Slight leakage or minor debris in non-critical area | ☐ Blood, saliva, debris in preparation<br>☐ Liner or base on cavosurface margin<br>☐ No rubber dam |

Student Name_____ Patient Name_____ Date_____

Evaluation in the gray area for any criteria will result in a failure of the competency exam.

# FACULTY #1 EVALUATION

## Anterior Composite Preparation Competency
## Areas Evaluated and Associated Criteria

| Evaluation | N<br>Ideal | S<br>Deviations from ideal but clinically acceptable | M/E<br>Moderate/extensive deviations from ideal/clinically unacceptable |
|---|---|---|---|
| **Anterior Composite Cavity Preparation** | | | |
| **Carious Tissue Removal** | ☐ Carious tissue & existing restorative materials are completely removed in a conservative fashion | ☐ Slightly questionable area remains | ☐ Soft dentin, DEJ staining, or existing restorative material remains |
| **Outline Form** | ☐ Smooth, flowing outline, terminates on sound tooth structure | ☐ Outline irregular or margins terminate in stain or calculus | ☐ Outline terminates in pits, fissures, decalcification or existing restorations |
| **Extensions** | ☐ Extensions conserve tooth structure yet provide access | ☐ Slightly over or under extended | ☐ Decidedly over or under extended |
| **Depth** | ☐ Depth minimizes pulpal trauma, maximizes retention | ☐ Slightly irregular, too deep or too shallow pulpally or axially | ☐ Decidedly too deep or too shallow pulpally or axially<br>☐ Mechanical pulp exposure |
| **Resistance Form** | ☐ Walls provide resistance form | ☐ Walls deviate slightly from ideal resistance form | ☐ Walls deviate significantly from ideal resistance form |
| **Cavity Refinement** | ☐ Smooth walls, well defined cavosurface margins & bevels | ☐ Small areas of roughness in walls, margins, or bevels | ☐ Generally rough or poorly defined walls, margins, or bevels |
| **Tissue Preservation** | ☐ Adjacent teeth restorations and soft tissues are preserved intact | ☐ Slight alteration of anatomic form of adjacent teeth, restorations or soft tissues | ☐ Damage to adjacent teeth, restorations or soft tissues<br>☐ Preparation of unassigned tooth or surfaces |
| **Rubber Dam Isolation, Cleanliness** | ☐ Clean preparation, well isolated, protecting soft tissues | ☐ Slight leakage or minor debris in non-critical area | ☐ Blood, saliva, debris in preparation<br>☐ Liner or base on cavosurface margin<br>☐ No rubber dam |

Faculty Initials_____ID #_____ Date_____

Student Name_____ Patient Name_____ Date_____

Evaluation in the gray area for any criteria will result in a failure of the competency exam.

# FACULTY #2 EVALUATION

## Anterior Composite Preparation Competency
## Areas Evaluated and Associated Criteria

| Evaluation | N<br>Ideal | S<br>Deviations from ideal but clinically acceptable | M/E<br>Moderate/extensive deviations from ideal/clinically unacceptable |
|---|---|---|---|
| **Anterior Composite Cavity Preparation** | | | |
| **Carious Tissue Removal** | ☐ Carious tissue & existing restorative materials are completely removed in a conservative fashion | ☐ Slightly questionable area remains | ☐ Soft dentin, DEJ staining, or existing restorative material remains |
| **Outline Form** | ☐ Smooth, flowing outline, terminates on sound tooth structure | ☐ Outline irregular or margins terminate in stain or calculus | ☐ Outline terminates in pits, fissures, decalcification or existing restorations |
| **Extensions** | ☐ Extensions conserve tooth structure yet provide access | ☐ Slightly over or under extended | ☐ Decidedly over or under extended |
| **Depth** | ☐ Depth minimizes pulpal trauma, maximizes retention | ☐ Slightly irregular, too deep or too shallow pulpally or axially | ☐ Decidedly too deep or too shallow pulpally or axially<br>☐ Mechanical pulp exposure |
| **Resistance Form** | ☐ Walls provide resistance form | ☐ Walls deviate slightly from ideal resistance form | ☐ Walls deviate significantly from ideal resistance form |
| **Cavity Refinement** | ☐ Smooth walls, well defined cavosurface margins & bevels | ☐ Small areas of roughness in walls, margins, or bevels | ☐ Generally rough or poorly defined walls, margins, or bevels |
| **Tissue Preservation** | ☐ Adjacent teeth restorations and soft tissues are preserved intact | ☐ Slight alteration of anatomic form of adjacent teeth, restorations or soft tissues | ☐ Damage to adjacent teeth, restorations or soft tissues<br>☐ Preparation of unassigned tooth or surfaces |
| **Rubber Dam Isolation, Cleanliness** | ☐ Clean preparation, well isolated, protecting soft tissues | ☐ Slight leakage or minor debris in non-critical area | ☐ Blood, saliva, debris in preparation<br>☐ Liner or base on cavosurface margin<br>☐ No rubber dam |

Faculty Initials_____ID #_____ Date_____

Student Name_____ Patient Name_____ Date_____

**STUDENT SELF-EVALUATION**

## Anterior Composite Restoration
## Areas Evaluated and Associated Criteria

| Evaluation | N<br>Ideal | S<br>Deviations from ideal but clinically acceptable | M/E<br>Moderate/extensive deviations from ideal/clinically unacceptable |
|---|---|---|---|
| **Anterior Composite Restoration** | | | |
| **Surface Quality** | ☐ Excellent Surface uniformly smooth | ☐ Slight roughness in small areas | ☐ Generally rough, irregular, pitted<br>☐ Restoration cracked |
| **Margin Integrity** | ☐ Excellent margins, nearly undetectable with sharp explorer | ☐ Slight detectable margins but closed | ☐ Pronounced marginal discrepancy (open, excess, deficient) |
| **Anatomy/ Contour** | ☐ Embrasures are hygienic and in harmony with natural tooth | ☐ Slightly over- or under-contoured | ☐ Decidedly over- or under-contoured<br>☐ Gross tooth reduction during polishing |
| **Proximal Contact** | ☐ Visually closed and smooth, resists unwaxed floss | ☐ Visually closed but light resistance to unwaxed floss<br>☐ Shreds with unwaxed floss but smooth to waxed floss | ☐ No resistance to shim stock or unwaxed floss<br>☐ Cannot floss through, floss breaks<br>☐ Visually open |
| **Function** | ☐ Occlusion is in harmony with centric and excursive movements | ☐ Slightly heavy occlusal contacts | ☐ Traumatic occlusion<br>☐ No occlusal function where indicated<br>☐ Fractured, loose or missing restoration |

Student Name_____ Patient Name_____ Date_____

Evaluation in the gray area for any criteria will result in a failure of the competency exam.

# FACULTY #1 EVALUATION

## Anterior Composite Restoration Competency
## Areas Evaluated and Associated Criteria

| Evaluation | N<br>Ideal | S<br>Deviations from ideal but clinically acceptable | M/E<br>Moderate/extensive deviations from ideal/clinically unacceptable |
|---|---|---|---|
| **Anterior Composite Restoration** | | | |
| **Surface Quality** | ☐ Excellent Surface uniformly smooth | ☐ Slight roughness in small areas | ☐ Generally rough, irregular, pitted<br>☐ Restoration cracked |
| **Margin Integrity** | ☐ Excellent margins, nearly undetectable with sharp explorer | ☐ Slight detectable margins but closed | ☐ Pronounced marginal discrepancy (open, excess, deficient) |
| **Anatomy/ Contour** | ☐ Embrasures are hygienic and in harmony with natural tooth | ☐ Slightly over- or under-contoured | ☐ Decidedly over- or under-contoured<br>☐ Gross tooth reduction during polishing |
| **Proximal Contact** | ☐ Visually closed and smooth, resists unwaxed floss | ☐ Visually closed but light resistance to unwaxed floss<br>☐ Shreds with unwaxed floss but smooth to waxed floss | ☐ No resistance to shim stock or unwaxed floss<br>☐ Cannot floss through, floss breaks<br>☐ Visually open |
| **Function** | ☐ Occlusion is in harmony with centric and excursive movements | ☐ Slightly heavy occlusal contacts | ☐ Traumatic occlusion<br>☐ No occlusal function where indicated<br>☐ Fractured, loose or missing restoration |

**Additional Comments:**

Faculty Initials_____ ID #_____ Date_____

Student Name_____ Patient Name_____ Date_____

Evaluation in the gray area for any criteria will result in a failure of the competency exam.

# FACULTY #2 EVALUATION

## Anterior Composite Restoration Competency
## Areas Evaluated and Associated Criteria

| Evaluation | N<br>Ideal | S<br>Deviations from ideal but clinically acceptable | M/E<br>Moderate/extensive deviations from ideal/clinically unacceptable |
|---|---|---|---|
| **Anterior Composite Restoration** | | | |
| **Surface Quality** | ☐ Excellent Surface uniformly smooth | ☐ Slight roughness in small areas | ☐ Generally rough, irregular, pitted<br>☐ Restoration cracked |
| **Margin Integrity** | ☐ Excellent margins, nearly undetectable with sharp explorer | ☐ Slight detectable margins but closed | ☐ Pronounced marginal discrepancy (open, excess, deficient) |
| **Anatomy/ Contour** | ☐ Embrasures are hygienic and in harmony with natural tooth | ☐ Slightly over- or under-contoured | ☐ Decidedly over- or under-contoured<br>☐ Gross tooth reduction during polishing |
| **Proximal Contact** | ☐ Visually closed and smooth, resists unwaxed floss | ☐ Visually closed but light resistance to unwaxed floss<br>☐ Shreds with unwaxed floss but smooth to waxed floss | ☐ No resistance to shim stock or unwaxed floss<br>☐ Cannot floss through, floss breaks<br>☐ Visually open |
| **Function** | ☐ Occlusion is in harmony with centric and excursive movements | ☐ Slightly heavy occlusal contacts | ☐ Traumatic occlusion<br>☐ No occlusal function where indicated<br>☐ Fractured, loose or missing restoration |

**Additional Comments:**

Faculty Initials_____ID #_____ Date_____