



2018-2019 DMD RESEARCH GUIDEBOOK

Introduction to HSDM Research

By leveraging its scientific strengths and focusing on the areas of skeletal biology and the pathology of bones, joints, vascular and connective tissues, as well as clinical, health policy, and global health research, HSDM has established a strategic direction for its research programs. As the only School within Harvard University with its own clinical facility, HSDM continues to differentiate itself through a unique emphasis on basic and clinical research combined with exemplary patient care and education. **All DMD students at HSDM must complete a scholarly project and present this work at HSDM Student Research Day as part of their graduation requirement. The Office of Research provides guidance and will support students as they fulfill their research requirements.**

HSDM Office of Research

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Research Requirements

1. Select a **Research Track**.
2. Identify a **Research Mentor**.
3. Identify a **Research Project**.
4. Obtain **IRB/IACUC Approval**.
5. Complete **Research Project** (Continue if Honors).
6. Write **10-Page Research Report** or **Thesis** (if Honors Project).
7. Submit **Abstract** for HSDM Student Research Day.
8. Present **Poster** at HSDM Student Research Day.
9. **Defend Thesis** if Honors Project.

Selecting A Research Track

All DMD students at HSDM must complete a scholarly project and present this work at HSDM Student Research Day as part of their graduation requirement. Students will be introduced to research activities at HSDM and will be asked to choose the **Research Track**, or **Global and Community Health Track**. The form for selecting a track is found at the end of this Guidebook.

Research Track

The “Research Track” will expose students to basic or clinical/translational research. Basic research or bench research aims to improve human health with scientific discoveries. Such discoveries typically begin at “the bench” with basic research — in which scientists study disease at a molecular or cellular level. This may include the use of animal models such as mice, chicks, and zebrafish. Basic scientists provide clinicians with new tools for use in patients and for assessment of their impact. Clinical/translational research aims to improve human health by translating scientific discoveries into practical applications that progress to the clinical level, or the patient’s “bedside.” Scientists are increasingly aware that this bench-to-bedside approach to translational research is really a two-way street. Clinical researchers make novel observations about the nature and progression of disease that often stimulate basic investigations.

Global and Community Health Track

The “Global and Community Health Track” overseen by the Office of Global and Community Health, will expose students to public health and health services projects with a focus on health promotion, access to care, disease prevention, pharmacological and behavioral interventions, epidemiology of dental diseases, and health care policy. Your research project in global and community health may include rotations through community health care settings to provide you with the tools necessary to become a leader in global and community health.

Identify A Research Mentor

The importance of mentor and project selection should not be overlooked; they are crucial to the quality of your experience and the successful completion of your requirements. Thus, you should expect to devote a considerable amount of time to this step, critically assessing the research environment offered by the mentor. Clearly, you should find the proposed project interesting and important. Beyond that, it is essential that the specific aims of the project be clearly delineated and feasible within the available timeframe. The mentor should have the resources to enable you to achieve the specific aims. If your project involves human subjects, you should ask whether the mentor has obtained the necessary IRB approval. If the mentor has not obtained approval, you should plan for additional time so that the mentor can obtain such approval. Ideally, a mentor will have demonstrated productivity by a record of publication and a record of private or public funding in a given area. A mentor does not have to be in the field of dentistry. **The most comprehensive database for Faculty mentors is on the Harvard Catalyst website: <http://connects.catalyst.harvard.edu/Profiles/SearchProfiles.aspx>.**

Identify a Research Project

DMD students have chosen projects in all area of basic, clinical, translational, public health, global health and epidemiological research. Students have chosen research mentors at HSDM and the Forsyth Institute as well as throughout the Longwood Medical Area and beyond. The Office of Research maintains databases of DMD student projects and mentors if you need additional information. Below are just a few examples of projects DMD students have worked on.

The role of Ddr2 in the articular cartilage degeneration of TMJs originated by a partial discectomy of TMJ disc (Yefu Li)

A 10-year retrospective radiographic study of implantium dental implants (David Kim)

The diagnostic accuracy of incisional biopsy in the oral cavity (Meredith August)

Dental hygienist-led chronic disease management system to control early childhood caries (Man-Wei Ng)

Impact on junior faculty of teaching opportunities during predoctoral education (Sang Park)

VEGF stimulates intramembranous bone formation during craniofacial skeletal development (Bjorn Olsen)

What Is important for confirming negative margins when resecting mandibular ameloblastomas? (Zachary Peacock)

Candidal carriage predicts candidiasis during topical immunosuppressive therapy (Sook-Bin Woo)

Vaccine hesitancy and online information: The influence of digital networks (Brittany Seymour)

A vibration device to control injection discomfort (Jeffrey Shaefer)

Assessing the accuracy of computer color matching with a new dental porcelain shade system (Shigemi Nagai)

Obtain IRB/IACUC Approval

HSDM students are subject to the same policies, guidelines and regulations as the Faculty of Medicine. It is therefore necessary for student research projects to be reviewed by the Office of Research Subject Protection. The Committee on Human Studies has an Internal Review Board and reviews all human subject-related research projects. The Standing Committee on Animals has an Institutional Animal Care and Use Committee and reviews all animal subject-related research projects. It is important to note, it is HSDM's policy that students should not submit their own application, but instead, work with their Research Mentor under his/her application. Information on HMS/HSDM IRB and IACUC training, requirements, and approvals, and all relevant documents, can be found on the website of the HMS Office for Research Subject protection, <http://www.hms.harvard.edu/orsp/index.html>. Students are required to obtain all appropriate HMS/HSDM institutional and site approvals (domestic or international) before commencing research activities. If you have a question about whether your research even needs an IRB review, contact them. They can be reached at orsp@hms.harvard.edu; 617-432-3071. Dr. Shigemi Nagai is also an excellent resource for IRB questions and troubleshooting.

Complete Research Project (Continue if Honors)

If you are fulfilling your research requirement, the next step is to write a 10-page research report. Honors projects must be worked on throughout all 4 years and completed by the end of your fourth year. All students are required to write and submit a 10-page, single-spaced research report describing their research experience, or a scientific manuscript, by the end of their third year. The 10-page research report essay can be written in the first person and does not need to be in the same official format as a written thesis. Please consider the following guidelines when writing your 10-page essay:

- *Why was the study done?*
- *How was the study done?*
- *What were the results?*
- *What do the study results mean?*
- *What did you learn from the project?*

Students who have written or contributed to a scientific paper/manuscript published (or submitted to) a peer-reviewed scientific journal can submit it instead of the research report described above. If you plan to use the journal article or manuscript as your research paper, you will need to include a cover sheet with: a summary of the paper (2 paragraphs) and, a detailed description of your role in the actual project, as well as your contribution to the written manuscript.

Write Thesis (if Honors in Research Candidate)

The format to be used for the thesis should be either that of a journal article or that of a formal thesis. The student should work closely with the mentor during the writing phases of the project. In either case, there are no page requirements or limitations. If you intend to use the journal article format, consult the requirements of the journal to which you intend to submit the manuscript.

At your mentor's discretion the format can be either one of the following: (1) A journal article of publishable quality, or (2) A formal thesis with the following thesis guidelines:

TITLE PAGE:

A Thesis Presented by
Full Name, including Middle Name of Author with No Abbreviations
to
The Faculty of Medicine
In partial fulfillment of the requirements
for the degree of
Doctor of Dental Medicine

Research Mentor: Name, Title
Institutional affiliation if other than HSDM

Harvard School of Dental Medicine
Boston, Massachusetts

Month and Year of Submission

ABSTRACT: In 500 words or less, summarize your project.

INTRODUCTION: Significance, Hypothesis, and Background. This section should review the pertinent literature and outline the major purpose of the research. Reference should be made to previous relevant studies in order to explain what has been done as well as to explain the purpose of this research. This section should include a succinct articulation of the hypothesis tested.

INNOVATION AND APPROACH: Experimental Design, Expected Outcomes, and Interpretation. Describe clearly and carefully the procedures and materials used; a reader should be able to repeat your exact methodology. This section should also include the overall research design and statistical methods.

RESULTS AND DISCUSSION: Report the results in a well-organized fashion with minimal subjective comment or reference to the literature. This section serves mainly to introduce tables and figures and to call attention to their significant parts.

CONCLUSION AND FUTURE DIRECTION: The data should be explained and interpreted with reference to the previous literature. The significance of the results may also be included. This is the section in which to emphasize subjective comment. In a thesis, the scope of the discussion extends beyond that of a journal article. For example, you may discuss why your first experiments failed, or how you arrived at the design for a particular protocol, or what you would do next if you were continuing the study.

REFERENCES: References must be double-spaced and numbered consecutively as they are cited. References first cited in a table or figure legend should be numbered so that they will be in sequence with references cited in the text at the point where the table or figure is first mentioned.

Submit Abstract for HSDM Student Research Day

All students presenting a poster at Research Day must submit an abstract (500 words maximum) of their research to the Office of Research for inclusion in an abstract book. A sample may be found at the end of this Guidebook. Your abstract should include brief sections that clearly and concisely describe:

- *Significance and background of the study*
- *Innovation*
- *Approach (experimental design, expected outcomes and interpretation)*
- *Results*
- *Conclusions*

Present Poster at HSDM Student Research Day

Student Research Day at Harvard School of Dental Medicine is an annual event held each April. The primary focus of this all-day event is for graduating DMD, MMSc, DMSc, and PhD students to showcase their research to faculty as well as fellow students at Harvard School of Dental Medicine, The Forsyth Institute and Harvard Medical School. Graduating students present an electronic research poster to faculty who in turn, evaluate their work. The Office of Research awards “best poster” certificates for each student group. E-Poster guidelines and a sample will be circulated in February 2019. Faculty and Postdoctoral Fellow reviewers look at six criteria when evaluating posters:

- *Student’s ability to describe the work and its significance;*
- *Organization and clarity of the poster presentation;*
- *Introduction and formulation of hypothesis and scientific method;*
- *Quality and extent of work done by the student;*
- *Student’s overall understanding of the project; and*
- *Overall evaluation of the poster and presentation.*

Defend Thesis if Honors Project

SELECTING A THESIS DEFENSE COMMITTEE

Once you are ready to defend your thesis, you must email your abstract to Dawn DeCosta. The Dean for Research will suggest potential committee members and you will arrange your defense according to their schedules. You must select two to three faculty members to serve on your defense committee. Your mentor may attend as a non-voting participant. The Office of Research will assist you with reserving a room for the defense session once you inform them of the date, time, and committee members at least two

weeks before the session. You must provide a copy of your thesis to all members of your defense committee at least two weeks before the session.

THESIS DEFENSE

The oral presentation is no more than 30 minutes and usually includes slides and/or overheads. The following discussion between the student and the committee usually lasts approximately 30 minutes. At that point the student will be excused from the room, the committee will discuss the work, and the student will then be invited back in to review the deliberations. The committee may make suggestions for alterations in the thesis, and following the revisions, provide the student with a signed thesis and evaluation. The Final Thesis Grade Sheet and Thesis Signature Forms must be brought to the defense by the student and signed by all committee members in order for final approval to be recorded. The committee may make suggestions for alterations to your thesis before providing their approval. These sheets then need to be returned to the Office of Research.

Additional Research Information & Forms

ACADEMIC, PROFESSIONAL, AND SCIENTIFIC CONDUCT:

PREPARATION OF PAPERS AND OTHER WORK

All homework assignments, projects, lab reports, papers and examinations submitted for a course are expected to be the student's own work. Students should always take great care to distinguish their own ideas and knowledge from information derived from other sources. The term "sources" includes not only published or electronic primary and secondary material, but also information and opinions gained directly from other people. It is each student's responsibility to understand the expectations of academic integrity, proper forms of citation, and submission of one's own work. In addition, collaboration in the completion of assignments is prohibited unless explicitly permitted by the instructor, in which case it must be acknowledged.

AUTHORSHIP GUIDELINES

Authorship is an explicit way of assigning responsibility and giving credit for intellectual work. The two are linked. Authorship practices should be judged by how honestly they reflect actual contributions to the final product. Authorship is important to the reputation, academic promotion, and grant support of the individuals involved, as well as to the strength and reputation of their institution. The Faculty Council of Harvard Medical School has endorsed the following statement. Although authorship practices differ from one setting to another, and individual situations often require judgment, variation in practices should be within these basic guidelines.

- *Everyone who is listed as an author should have made a substantial, direct, intellectual contribution to the work. For example (in the case of a research report) they should have contributed to the conception, design, analysis and/or interpretation of data. Honorary or guest authorship is not acceptable. Acquisition of funding and provision of technical services, patients, or materials, while they may be essential to the work, are not in themselves sufficient contributions to justify authorship.*
- *Everyone who has made substantial intellectual contributions to the work should be an author. Everyone who has made other substantial contributions should be acknowledged.*
- *When research is done by teams whose members are highly specialized, individual's contributions and responsibility may be limited to specific aspects of the work.*
- *All authors should participate in writing the manuscript by reviewing drafts and approving the final version.*
- *One author should take primary responsibility for the work as a whole even if he or she does not have an in-depth understanding of every part of the work.*

RESEARCH RESOURCES:

CORE RESEARCH FACILITIES

The Harvard Catalyst core facilities database is powered by the eagle-i network and is searchable by category, institution, or keyword <https://cores.catalyst.harvard.edu>. Please contact Jim McBride, Director of Core Labs at HSDM, if you are interested in learning more about our facilities or have questions regarding facilities, equipment, or training. It is important to note that you must be trained to use equipment and access laboratories at HSDM.

SUBMITTING A GRANT APPLICATION

If you do plan on submitting a grant application, please work with the Office of Administration and Finance. They must be notified prior to the submission deadline. All grant applications must be approved through the Office of Administration and Finance as well as your Research Mentor prior to submission. This pertains to all funding (including but not limited to government awards, foundation awards, dental society awards) even if they do not require institutional approval. If you have any questions about this policy, please

Speak with Andrea Morris (andrea_morris@hsdm.harvard.edu).

RESEARCH TRAVEL AWARDS/POSTER PRINTING

If you present a research poster at a national or international conference, then you are eligible to receive a \$500 travel stipend and poster printing through the Office of Research. Please note, you may apply for this stipend annually (once per fiscal year); contact Dawn DeCosta to apply for a travel stipend. For poster printing, the HSDM Office of Research has an account at www.phdposters.com. From this link, click orange tab "Start your order now" then under the three orange tabs, you will see a link "or use a PhD Posters group account," click here and then log in **HSDM**; password **HSDMResearch**.

SAMPLE RESEARCH DAY ABSTRACT

A Longitudinal Study of Ovarian Morphology in Healthy Ovulatory Women

Meagan K. Murphy
Harvard Medical School, Class of 2008

Corrine K. Welt, MD
The Reproductive Endocrine Unit, Department of Medicine
Massachusetts General Hospital

Polycystic ovary syndrome (PCOS) affects 5-7% of reproductive aged women. Though its phenotypic expression is variable, PCOS is also associated with infertility, insulin resistance, obesity, cardiovascular risk factors, and endometrial cancer. PCOS is diagnosed using two of three clinical criteria: menstrual dysfunction, hyperandrogenism, and/or polycystic ovarian morphology on ultrasound. Polycystic ovarian morphology (PCOM) is defined as increased ovarian volume or ≥ 12 follicles/ovary.

PCOM on ultrasound is almost universal in women with PCOS. However, PCOM is also found in 16-25% of apparently normal, regularly cycling women. Normally cycling women with PCOM have been shown to have higher androgen and fasting insulin, and lower SHBG levels than women with normal ovarian morphology. Though these levels were still within normal ranges, they reflect trends toward the hormonal abnormalities seen in PCOS.

Based on these hormonal differences, we hypothesized that women with PCOM have an increased propensity to develop PCOS over time compared to women with normal ovarian morphology. To test these hypotheses, women with regular menstrual cycles and normal or polycystic ovary morphology on ultrasound were studied ($n=38$) 1.7-18.3 years after a previous ultrasound (mean \pm SD, 8.61 \pm 5.1 years). Subjects underwent a repeat ovarian ultrasound, interval menstrual history, physical exam, and measurement of gonadotropin, androgen and metabolic hormone levels in the early follicular phase.

At the first visit, twenty-three women (60.5%) had PCOM and fifteen (39.5%) had normal ovarian morphology. Among women who had PCOM at previous visit, twelve maintained PCOM and eleven converted to normal morphology at the second visit. In subjects that converted to normal morphology, there was a greater decrease in testosterone from the first to second visit than in those that maintained PCOM (-25.1 ± 10.2 vs. 2.3 ± 4.5 ng/mL; $p<0.05$). One subject with PCOM developed irregular menses during the interval. Among women with normal ovarian morphology at previous visit, two developed PCOM (13.3%), and thirteen maintained normal ovarian morphology. There was no obvious difference in weight, androgens, or metabolic parameters in the two subjects who developed PCOM.

These data indicate that PCOM in women with regular cycles does not appear to confer increased risk for the development of PCOS. Approximately half of women with PCOM convert to normal ovarian morphology with aging, and this conversion is associated with a greater decrease in testosterone over time. These data also show that in women with regular cycles, it is not common to develop PCOM if the ovaries are normal on first assessment.



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School of Dental Medicine

Selecting A Research Track

Due no later than December 31, 2018

Please return completed application materials to
Dawn M. DeCosta, Office of Research, REB-404 or email
Dawn_DeCosta@hsdm.harvard.edu

Complete all fillable fields below:

Name of Student

Society

Year of Graduation

Senior Tutor

Proposed Research Mentor

Proposed Research Title

Research Track or Global and Community Health Track

Please attach a 1-2-page summary of the proposed project you plan to conduct. You may include details of an ongoing/proposed larger project for clarity, but must indicate clearly what your independent role is expected to be. Indicate how you plan to fit the work into your academic schedule.



HARVARD
School of Dental Medicine

Honors in Research Thesis Defense Signature Form

Due no later than May 1, 2019

Please return completed application materials to
Dawn M. DeCosta, Office of Research, REB-404 or email
Dawn_DeCosta@hsdm.harvard.edu

We, the undersigned, have read and approved the thesis of **Name of Student** submitted in partial fulfillment of requirements for the degree of Doctorate of Dental Medicine at Harvard School of Dental Medicine.

Examiner

Examiner

Date



Honors in Research Grade Sheet

Due no later than May 1, 2019

Please return completed application materials to
Dawn M. DeCosta, Office of Research, REB-404 or email
Dawn_DeCosta@hsdm.harvard.edu

Complete all fillable fields below:

Name of Student

Date

Research Mentor

Research Title

Examiner

H = Honors P = Pass F = Fail

- | | | | |
|--------------------------------------|---|---|---|
| 1. Scientific Validity | H | P | F |
| 2. Thesis as a Document | H | P | F |
| 3. Student's Knowledge | H | P | F |
| 4. Student's Contribution to Project | H | P | F |

Comments:

Examiner

H = Honors P = Pass F = Fail

- | | | | |
|--------------------------------------|---|---|---|
| 1. Scientific Validity | H | P | F |
| 2. Thesis as a Document | H | P | F |
| 3. Student's Knowledge | H | P | F |
| 4. Student's Contribution to Project | H | P | F |

Comments:



Research Day Poster Presentation Evaluation

Due no later than May 1, 2019

Please return completed application materials to
Dawn M. DeCosta, Office of Research, REB-404 or email
Dawn_DeCosta@hsdm.harvard.edu

Complete all fillable fields below:

Name of Student

Research Mentor

Name of Evaluator

Please score each category numerically (1 being the weakest and 10 being exceptional).

- | | |
|--|--|
| 1. Ability to describe the work and its significance | 1 2 3 4 5 6 7 8 9 10 |
| 2. Organization and clarity of the poster presentation | 1 2 3 4 5 6 7 8 9 10 |
| 3. Introduction and formulation of hypothesis/scientific method | 1 2 3 4 5 6 7 8 9 10 |
| 4. Quality and extent of work done by the student | 1 2 3 4 5 6 7 8 9 10 |
| 5. Overall understanding of the project | 1 2 3 4 5 6 7 8 9 10 |
| 6. Overall evaluation of the poster and presentation | 1 2 3 4 5 6 7 8 9 10 |
| 7. Would you recommend this student for a poster presentation award? | YES <input type="checkbox"/> NO <input type="checkbox"/> |

Comments:



HARVARD

School of Dental Medicine

Travel Reimbursement Form

The Office of Research considers funding requests from students who are traveling to present their research. Students may receive up to \$500 per fiscal year (July 1-June 30) in research travel funding towards accommodations, transportation and registration fees. Reimbursements are submitted upon return of travel. Receipts or proof of payment is required and must be in your name.

Please return completed application materials to
Dawn M. DeCosta, Office of Research, REB-404 or email
Dawn_DeCosta@hsdm.harvard.edu

Complete all fillable fields below:

Name of Student

HUID #

Research Mentor

Dates of Travel

Name of Conference or Meeting

Have you ever received a reimbursement from Harvard? YES (WHAT YEAR?) NO

If you have never received a reimbursement from Harvard, please see Leanne Jacobellis in REB 408 to provide her with your social security number (do not email this information).

Are you a U.S. Citizen? YES NO

For non-US residents, once the above information has been submitted to HCOM by the Office of Research, you will receive an email from support@online-tax.net, an online tool to determine U.S. residency status) providing information on how to log into their program. You must complete their online forms and submit the required document to the NRA Tax Group office as indicated in the program. Your acceptance into the HCOM finance system will not complete until this is successfully completed and accepted by Harvard.

Current Mailing Address

Permanent Mailing Address