BOSTON UNIVERSITY

Boston University School of Medicine
Division of Graduate Medical Sciences
M.S. in Clinical Research Program

MSCR Capstone Description & Expectations

Students in the MSCR program are required to complete a Capstone Research Paper that provides a culminating experience and applies the principles and methods learned in the coursework to a real-life clinical study.

Students may conduct their research in wide variety of settings, including academic medical centers and local drug or device companies. Possible Capstone topics ***must*** be discussed with the MSCR Director and Assistant Director when submitting the Capstone proposal.

Students generally identify their research mentor and develop their Capstone proposal while they are completing their course work or practicum. The *Capstone research must involve the analysis and interpretation of data*. Students are encouraged but are not required to conduct primary data collection. The Capstone proposal and research mentor **must be approved by the MSCR Program Director or Assistant Director *prior to*** the Capstone beginning.

The ***Capstone proposal*** (usually 1-2 pages), which describes the nature of the Capstone research, with a clear statement of the research question or hypothesis, must be submitted for approval to the Program Director and Assistant Director. The specific primary outcome measure that will be used to answer the study question should be clearly described. A brief description of the planned statistical analyses is required. The proposal should conclude with a description of your role in the Capstone research. The minimum role is formulating and conducting the analysis, and interpreting and writing up the results. In addition, the student, and the MSCR Director & Assistant Director should agree upon a proposed time line for completion.

Selection of Capstone Readers:

At least two readers are required for the Capstone Research Paper. Generally, the first reader is the Director or Assistant Director of the MSCR program and the second reader is the research mentor, who serves as a content expert. Additional readers may be desired depending on the nature of the research.

Readers must be approved by the Director or Assistant Director of MSCR.

Once the Readers are selected, students are required to submit the online CAPSTONE APPROVAL form. Once submitted this form will be sent to the Program Assistant Director for documentation of the commitment to the Capstone Research Project.,

It is also important to email each Reader/Mentor the "Capstone Mentor & Reader Responsibilities" document so that your readers are aware of their responsibilities (this form can be found on the MSCR Website - http://www.bumc.bu.edu/gms/maci/program-overview/degree-requirements/Capstone/

Capstone Research Seminar:

All students are required to present their Capstone Research Projects in a research seminar. You will not be allowed to present your work if you do not adhere to the guidelines below – please plan accordingly:

- The ***near final draft*** of your Capstone paper must first be approved by your readers **2 weeks *BEFORE*** moving forward with your presentation.
    - ***What does it mean for a Capstone paper to be in "near final form"? This means that your paper has all of the necessary components and incorporates feedback from all of your readers. Readers should have the opportunity to provide feedback throughout the Capstone writing process and should be given ample time to review each draft.***

Your Readers must Email the Assistant Director, Stacey Hess Pino (sahess@bu.edu), confirmation at ***least 2 weeks BEFORE*** your scheduled research presentation, that your Capstone paper is in its near final form and that you have their permission to move forward with the scheduled presentation.

Each reader must confirm via email that the Capstone paper is in its near final form before you will be allowed to present.

It is **YOUR** responsibility to make your readers aware of this expectation/requirement.

At this same time - at ***least 2 weeks BEFORE your scheduled presentation - you must also email your near final Capstone paper and abstract to the MSCR Director & Asst. Director for their review and approval of your Capstone status.***

Once the near final draft is approved by all readers, the MSCR Director and Asst. Director, the student will give a 20 minute oral presentation on their research followed by a 10 minute question and answer period.

The purpose of the oral presentation is to demonstrate the student's ability to:

(1) describe clearly the Capstone research question, methods, and results; and,

(2) demonstrate an understanding of the study design, analytic principles, conclusions and limitations of his/her research; and

(3) place his/her research into a clinical context, while then proposing the next steps which should be taken with respect to future research.

The presentation is followed by a question and answer period.

FINAL STEP IN THE CAPSTONE PROCESS

The final step in the Capstone process is to submit to Stacey a copy of your final, approved abstract. Stacey will then submit the abstract along with the requisite paperwork to the GMS Registrar as confirmation that you have met the requirements for graduation. Please be certain to adhere to the GMS formatting of the abstract.

Capstone Research Paper Content/Written Expectations

For MSCR Students

This is your work! It should be in your own writing! Your Readers should simply provide qualitative feedback to guide your writing through the process; it is important that they not re-write your paper in their own words and expertise.

When this is done, the differences in writing style are very apparent so please avoid the tendency to simply accept your Readers revisions – rather, use the revisions as a guide and revise the content in your own words.

This will demonstrate that you understand the context and content of your topic, including how you critically evaluate and apply your results to previous research, and the implications of your findings beyond your study.

I. **Abstract:** This should be a a SHORT, CONCISE SUMMARY of your overall research project in **no more than (< 350 words). The purpose of the abstract is:

a. to put your work into context and presents your conclusions;
b. to tell the reader what you did;
c. to tell the reader what you found (but doesn't provide statistics);
d. to clearly state the implications of your findings.

The Abstract should include the following sections:

- *Introduction/Background:* 1 sentence to provide a brief context of your research project,plus a sentence stating the research question.
- *Methods*: A *few* sentences describing *parameters of your project:*
  - Where and when it was conducted
  - Sample size
  - Variables/Outcomes assessed
  - Methods used to collect the data
- *Results:* A *few* sentences describing the findings of the research project.
- *Conclusion* -1 *sentence* describing the main finding of the research project.

II. **Background:**

- This Section provides the ***theoretical and/or historical background information*** necessary for the reader to understand the project, to place it in its appropriate context, or to judge its contribution to the field, i.e. **you should**

present the previous literature to support WHY you are doing your study/what is missing from the current literature that led you to your study aims.

- This Section is essentially the ***introduction,*** which explains in general terms what the research is about and provides a context for your work.

- This Section should include a description of what is the "***state of the art***" and an explanation of how your research contributes to the field:

    1. **Purpose:** after you have provided the background/introductory information, the ***Purpose*** of your research should be stated within this Section.
    2. **Primary Study Question:** the Purpose paragraph should be followed by a statement/explanation of your ***Primary Study Question***, i.e. what did you intend to answer with your research.
    3. **Primary/Secondary Objectives:** the next paragraphs should describe the primary and secondary objectives of your research.
    4. **Study Rationale:** this final paragraph in this section should include a description/statement of your study rationale, i.e. the reasoning or motivation for conducting/performing your proposed research/who has tried to address this issue in the past and why their results were inadequate.

III. Materials and Methods:

The Methods section should be written in the past tense

- ***How did you study the problem?*** *Explain and describe the procedures used.*

- ***What did you use?*** *Describe materials used and subjects recruited and enrolled.*

- □***How did you proceed?*** *Explanation of the steps taken to collect your data.*

- This Section should provide the reader with the impression of ***HOW*** the study was conducted overall, and which techniques/procedures were used/executed. You should also define/differentiate the standard of care from the research procedures [if a clinical research study was conducted].

    1. **Study Design:** A statement/description of your study design should be included.

    2. **Subject Population:** You should provide a description of how the subjects were selected, including the details of your inclusion and exclusion criteria.

    3. **Detailed description of how the data was collected or obtained. If your study involved an analysis of existing data, you should describe where the data came from, what data was collected,**

4. **Statistical Analysis:** A statistical analysis section is very specific to the study design and question being asked. These are some general guidelines.

    - You should provide a description of what type of statistical analyses were performed to assess your outcome measures, i.e. primary outcome, secondary outcomes. **You should clearly define your outcomes and other study variables.**
    - ***Sample size***: A description should be provided of how your sample size was calculated, if appropriate.
    - ***Confounders***: You should describe those elements/factors that are potential confounders in your research and describe how you will address confounding in your statistical analysis.

Remember, the Methods section should be written in enough detail that another researcher would be able to duplicate your study.

IV. Results:

- In this Section you should report on what you found from your research, i.e. the data/findings that resulted from your research. ***You should always provide data to support a claim or finding***.
- You should describe the findings that resulted from the analyses of the data.
- You should describe the differences that were found between the groups studied and any situations where differences were not found; any trends that became apparent; and any associations that were found.
- You should also describe what is presented in your tables and figures. **Do NOT simply repeat what is in your tables & figures, but note important or interesting features of your data.**

V. Discussion: ***CRITICAL THINKING PIECE***

- This Section should present***, interpret*** and discuss the adequacy of your results and of the research that was performed
- The Section summarizes the preceding ones, but it also should re-enforce the relationship, if any, of your results and its contribution to the field:
    - Does your work support current theories and observations in the field
    - Have your results advanced our understanding of the area
    - How are your results relevant to what is understood today?
    - What are the implications of your results today?
- **The discussion should not simply be a reiteration of your results!**
- The end of the discussion section should include the following:

1. **Strengths:** What were the strengths of your study design and approach to research that were strengths compared to prior research done in this field?

2. **Limitations:** You should ***discuss*** the limitations of your research, i.e. discuss any constraints, failures, or weaknesses of your project. Don't just state what the limitations of your research were, rather EXPLAIN them and how they may have affected your study's findings.

3. **Future Directions:** Student should discuss the future directions of their research and recommendations for future studies, i.e. student should stress the potential impact of their accomplishments if work on the project were

to continue or discuss whether a new study could address some of the difficulties or challenges encountered in this study.

VI. Conclusions:

- This Section is a summary of intent of your research, the methods used to assess your study objectives, the results found and the conclusion drawn from the results, i.e. were you able to answer your study question from the results obtained in your research.

Tips:

The most common problem with the early stages of Capstone writing is the ***inability to support your claims***. **You need to back up every idea, result or claim in a research paper with data that logically supports it;** it isn't enough to base a hypothesis on a simple hunch. If you're having difficulty finding data to support a point in your Capstone, consider removing the point; not being able to support an idea might mean the idea isn't presently valid.

EDIT THE COPY AND CONTENT

Be prepared: you'll probably spend almost as much time editing your Capstone as you did writing it.

- Consider the content first: Is your argument logical? Does each section make sense in relation to those before and after it? Is each bit of information relevant and backed up with supporting data? Are there repetitions?
- Then, move on to the copy: are there misspellings or punctuation and grammar mistakes? Run-on sentences? Are all of your pronouns and antecedents crystal clear? Are the acronyms explained?
- Strive to make everything completely and perfectly understandable.

Publication:

Submission of your work to a clinical research journal is ***not*** a requirement of the MSCR program, however students are encouraged to consider submission and potential publication. The Capstone Research Paper is written in a format that is easy to convert to a journal article. Note that every journal has slightly different requirements for submission, but the components of a published paper are fairly similar. Students are encouraged to discuss potential publication with their research mentors.