

# **Academic Program and Curriculum Committee Review of the Undergraduate Program in Biomedical Sciences**

**Review Team:**

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## **1. Introduction**

The Department of Biomedical Sciences completed the program self-study on the Biomedical Sciences (BMS) program in 2022. The review team used the self-study report as a reference for interviews with the faculty, students, and academic staff. The self-study report covers the 2012-2013 through 2020-2021 academic years. The review team appreciates the time and thoughtful responses of those interviewed.

The BMS undergraduate program administers a single major with several sub-majors (concentrations). The sub-majors cover two broad areas of study: 1) laboratory-based and 2) diagnostic imaging-based programs. The laboratory-based program includes BMS, Medical Laboratory Sciences (MLS), Public Health Microbiology, Cytotechnology, and Health Sciences. The diagnostic imaging-based program includes Radiological Technology (RT), Medical Sonography, and Diagnostic Medical Imaging. During the review period, the BMS program had an average of 607 majors. MLS and RT are accredited programs. The other sub-majors either are not accredited, or the accreditation is not held by UWM.

The Department was housed in the College of Health Sciences during the review period. However, it became part of the School of Biomedical Sciences & Health Care Administration as a part of the College of Health Professions and Sciences (with the School of Nursing and School of Rehabilitation Sciences & Technology) in July 2023. The Program has ten academic staff, one assistant professor, three associate professors, and one full professor.<sup>1</sup>

The Program aims to train lab science and imaging health care professionals who are vital components of the health care industry in southeast Wisconsin. They are in high demand because the shortage of laboratory scientists is a long-standing issue. In addition to teaching students up-to-date knowledge and skills in their specific BMS area, the Program prepares them to work in a wide variety of settings by educating them in sound principles and techniques in all areas of their profession. The program curriculum is also intended to develop the foundation for the student to advance on the career ladder and continue professional growth. The Program's success is evident in the perfect job placement rates and high certification and exam pass rates among recent MLS and RT graduates.

**Recommendation 1:** The BMS program should continue.

## **2. Actions since Previous Review**

### **A. Response to Previous Review**

The main recommendations of the 2012 review were to increase the number of faculty and decrease the number of sub-majors. Currently, there are only five tenured or tenure-track faculty members. Sub-majors are administered in cooperation with other programs, which results in minimal cost to the department. Therefore, the program has even increased the number of sub-majors during the current review period. These include the Diagnostic Imaging degree completion, Health Sciences degree completion, and Health Science sub-major. These tracks are designed for non-traditional or at-risk students. Those students can choose the Flexible Option with UWEX Flex as a college-wide program if it is beneficial for them.

### **B. Opportunities and Challenges**

The demand for BMS graduates remains high, particularly in the fields of Diagnostic Medical Imaging and MLS. As a result, BMS enrollment has remained stable during the university-wide decline. However,

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<sup>1</sup> One associate professor has a college-level administrative position.

it is challenging to secure clinical site placements. Changes in UWM's technology fee structure have resulted in an annual revenue loss of approximately \$66,000.

### **3. Department/Program Overview**

#### **A. Department/Program Mission and Organizational Structure**

Aligned with the University's strategic directions, the mission of the Biomedical Sciences Program is excellence in research, teaching, and service.

##### **1. Research Excellence**

The BMS faculty and staff will produce recognized basic and applied research that influences the science and practice of medical sciences. To build upon our recognition as a leader in the generation of knowledge, they will recruit, develop, and maintain high-quality researchers and facilities.

##### **2. Teaching Excellence**

The BMS faculty and staff will produce professional practitioners, managers, educators, and researchers who are uniquely prepared for the dynamic environment of healthcare and are recognized by employers as being of the highest quality. To this end, the BMS academic programs will be flexible, innovative, and responsive to the changes in our areas of practice. This will be accomplished, in part, through partnerships with healthcare providers and industry.

##### **3. Service Excellence**

The BMS faculty and staff members will commit themselves to providing service that enhances the missions of our College and of the University by addressing the educational, environmental, and economic needs of the local, state, and national healthcare community.

The Department is also committed to diversity, inclusion, and equity. Around 27% of BMS majors consist of underrepresented students. As previously stated, the Department has introduced new sub-majors to enhance retention rates amongst at-risk or non-traditional students, many of whom also belong to underrepresented populations.

During the review period, the Department of Biomedical Sciences was one of five departments in the College of Health Sciences. The Department was led by a Chair, a Graduate Program Coordinator, an Undergraduate Laboratory Program Coordinator, a Director of the Radiographic Technology Program, and a Director of the Sonography Program.<sup>2</sup>

The Executive Committee of the Department of Biomedical Sciences, which consists of tenured faculty, oversees issues related to workload, personnel, and budget. Additionally, the BMS Program has instructional staff who actively participate in the governance of the program as voting members of the department. Both graduate and undergraduate students are welcome to serve on the search and screen committees and participate in program accreditation and other program review procedures.

#### **B. Facilities and Resources**

Standards addressed in this section:

*i. There are sufficient resources to meet program needs to provide for program stability.*

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<sup>2</sup> See the introduction section for the current structure due to the reorganization.

No, please see below for elaboration.

*ii. There are sufficient resources to meet program needs to provide for facilities and space within the university.*

There appear to be adequate laboratory resources for teaching purposes. The introduction of lab fees starting in 2020 means that there is money for course supplies matched to enrollment. In addition, funds for equipment replacement/upgrading have been possible on a very limited basis since 2015. However, the department lacks the capital budget needed for major equipment purchases. This has led to potentially problematic procedures for lab maintenance. For instance, the faculty told stories of taking supplies in need of autoclaving to the Psychology department. While they were successful in doing so, such a workaround signals gaps in equipment needed for daily laboratory operations. Autoclaving is critical to maintaining the hygienic conditions needed in clinical settings to ensure proper patient care. It is the largest piece of equipment that is most vulnerable under such financially strapped conditions. The faculty told of an “act of god” that replaced the imaging equipment in the basement of the Northwest Quad used for teaching Diagnostic Medical Imaging students. The model in use at UWM was no longer the same as that used in the clinical settings that students interned in or would be hired into. This severely hurt their training. Unfortunately, there was a flood in the NW quad and the lab itself was rendered unusable. Fortunately, the department was able to collect insurance money and replace the equipment.

Such a success story is also a story of failure. It is essential that the university find the money to update equipment for student training. The Diagnostic Medical Imaging program, like BMS as a whole, is successful in placing students in jobs. That will no longer be the case if the students do not have experience with routinely used clinical equipment.

The program is also short on teaching space for the number of students that it currently teaches. Again, while the department has been clever in finding workarounds, the lack of space leads to cramped conditions in which students are on top of each other, a condition not amenable to quality instruction.

*iii. There are sufficient resources to meet program needs to provide for facilities and space outside the university.*

As a clinical program, BMS has agreements with many different hospitals and laboratories in the local area for training students in their last year. All of these institutions are accredited by the Joint Commission on Accreditation of Health Care Organizations (JCAHO), the State of Wisconsin, and/or the College of American Pathologists (CAP). In the opinion of the BMS faculty, all provide excellent training.

**Conclusion:** The standards in this section are not met.

**Recommendation 2:** BMS needs support from the University to upgrade its laboratory equipment, so that it keeps up with changes in clinical technology. The self-study is very clear that the necessary funds total \$10-12,000, a number that pales in comparison to the number of students produced by the program who find ready employment in the local area.

### **C. Curriculum and Instruction**

Standards addressed in this section:

*i. There is an organized and coherent sequence of coursework that prepares students to meet the educational goals of the program, secure appropriate employment, and pursue graduate study.*

The self-study (page 14 ff.) addresses the curriculum and refers the reader to Appendix 2F for the sequencing of the BMS degree and sub-majors. Undergraduate courses are arranged in a sequence where students start with pre-professional courses and then move to professional courses. The pre-professional program consists of the first two years of the undergraduate curriculum, which includes GER and foundation courses that serve as prerequisites for many of the advanced courses in the professional programs. The professional program consists of upper-division courses in each of the sub-majors, where the curriculum is focused on professional application courses. Generally, students complete two years of coursework before applying to the major and must achieve a minimum GPA of 2.5 to be admitted (3.0 for Diagnostic Medical Imaging).

The course objectives provided in each course syllabus align with the BMS Program's educational goals and the educational standards of national certification agencies. Students are exposed to a mix of didactic and laboratory experiences, both on-campus and at clinical affiliates, that are designed to help graduates meet the entry-level competencies outlined by accrediting and professional organizations.

*ii. The learning outcome reflects expected workforce competencies.*

The BMS Program keeps itself updated with changes in expectations or practices in the field by gathering feedback from students, clinical instructors, and clinical education coordinators. Additionally, the program has two Advisory Committees - the Medical Laboratory Science Advisory Committee and the Diagnostic Imaging Advisory Committee. Each semester, meetings are held with healthcare professionals who work with students in clinical training sites to gather information. The near-perfect job placement and certification rates over the last six years are commendable and undoubtedly indicate that the learning outcomes of the BMS program align with expected competencies in the workplace.

**Conclusion:** The standard addressed in this section is met.

**Recommendation 3:** The BMS program should continue its ongoing and successful efforts to update the curriculum, so that students' education remains relevant to the current and future healthcare environment.

#### **D. Assessment and Evaluation**

Standards addressed in this section:

*i. An evaluation process that involves students, faculty, graduates, and community members, as appropriate, is in place and the data gathered is used to monitor the program and direct its changes.*

The program evaluates and assesses its outcomes using either WEAVE or accreditation standards to ensure that instructional quality is maintained across all modes of delivery. Based on the assessment and evaluation data, the program makes changes and adjustments to the curriculum and advising.

*ii. 90% of students complete the program within five years.*

On average, BMS majors completed their Bachelor's degree within 24 months after declaring the major.

*iii. 75% of graduates have satisfactory employment within one year of graduation.*

During 2016-2020, the graduates of the accredited programs (MLS and RT) had a 100% six-month job placement rate.

*iv. Relevant credential, if any, achieved within 1 year of graduation.*

During 2016-2020, the average certification rate for MLS graduates was about 90%. The average exam pass rate for RT graduates was about 93% (including multiple attempts) during the same period.

**Conclusion:** The standard addressed in this section is met.

**Recommendation 4:** The BMS program should develop an assessment and evaluation plan for non-accredited submajors.

**E. Contribution to General Education**

The BMS program contributes to the UWM’s General Education by offering 5 GER courses (3 Natural Science and 2 Social Science).

- BMS 201 - Sexually Transmitted Diseases & Aids (NS)
- BMS 205 - Introduction to Diagnostic Medicine (NS)
- BMS 232 - Introduction to Nutrition (NS)
- BMS 245 - Client Diversity in Health Sciences: An Interdisciplinary Perspective (SS)
- BMS 260 - Introduction to Complementary & Alternative Medicine (SS)

**4. Faculty**

Standards addressed in this section:

- i. Faculty and instructional academic staff are qualified and in sufficient numbers to provide quality learning experiences.*
- ii. At least 25% of total tenure-tenure track faculty time is committed to the undergraduate program.*

**A. Faculty Composition / B. Faculty Numbers and Qualifications**

Laboratory courses in the sub-majors leading to certification, specifically Medical Laboratory Science and Diagnostic Medical Imaging are well-staffed by ten qualified Instructional Academic Staff with appropriate professional certifications. Tenure-track faculty include one Assistant Professor, three Associates, and one Full Professor; they are all well qualified for the academic courses they teach, with substantial records of ongoing research and publication. The last ten years have seen a substantial number of faculty and staff leave, for a variety of reasons. While seven tenure-track faculty have left, there has been only one hire during that time. On the staff side, things have been more stable, with hires evenly balancing departures.

Of the senior faculty, at the start of the 2022 academic year, one was chair and another was Associate Dean. The department needs **two to three faculty lines** just to stabilize governance. If even one faculty member became ill or left for another job, it would be catastrophic for the ability to run the undergraduate program and the department.

**C. Faculty Workload**

		Teaching focus	Research focus	Activity Distribution (% of effort devoted to each area)	% of time to
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	Courses taught in a typical AY			Teaching	Research/scholarship	Admin/Service	the program
Doll, J	2	Molecular Biology	Prostate cancer – molecular & cellular biology	25%	25%		50%
Eells, J	6			60%	20%	20%	100%
Nardelli, D	4	Immunology, microbiology	Lyme disease	40%	40%	20%	100%
Skwor, T	4	medical and public health microbiology	Bacteria; antibiotic resistance; photodynamic inactivation	40%	40%	20%	100%
Anders, S	8	MLS		100%			100%
Cordas, D	8	Radiologic Technology		100%			100%
De Oliveira, L	4	Nutrition		90%		10%	50%
De Pons, B	6	MLS		80%		20%	100%
Hirshfeld, M	6	Radiologic Technology		80%		20%	100%
Hou, S	8	Hematology		100%			100%
Liedhegner, E	3	Molecular diagnostics/pathophysiology	Molecular signaling mechanisms in disease pathogenesis.	30%	30%	40%	100%
Lunak, Z	4	MLS		50%		50%	100%
Wisniewski, J	6	Radiologic Technology		50%		50%	100%
Stalewski, S	4	MLS		80%		20%	25%

According to the data provided and the conversation during the site visit, more than 25% of the time of tenured or tenure-track faculty is dedicated to undergraduate education, which includes advising, teaching courses, and the SURF program.

**Conclusion:** The standards addressed in this section are met.

**Recommendation 5:** Considering its high potential for growth, the department should be a high priority for the allocation of tenure lines in the coming years. The BMS program is stable at its current level of staffing, but even one departure could jeopardize this situation.

## 5. Students

## **A. Student Numbers and Composition**

*Standard addressed in this section:*

*i. There are adequate numbers of qualified students for meaningful cohorts to meet learning objectives.*

In addition to data and analysis from the 2022 Self-Study, this review draws on interviews with three current undergraduates and one recent graduate of the BMS program. All were female, and one student was a racial/ethnic minority. These students showed a sophisticated understanding of applied medical science and seemed very well prepared for their careers. The recent graduate has a position in a medical laboratory. All of them indicated strong general satisfaction with the Program.

The number of BMS majors has remained strong over the last ten years, with an average of 607. From 2015 to 2019, the BMS program experienced slight decreases in majors which were consistent with larger trends across both the College of Health Sciences and campus. In recent years, this has reversed and the program has shown an upward trajectory in the number of majors.

This change is largely due to the implementation of the Health Sciences sub-major. The sub-major serves students who have completed credits as pre-majors or majors in health-related programs and are in good academic standing but were not admitted to a major, or who were unable to complete the degree due to major-specific requirements or clinical education capacity constraints. The introduction of the sub-major has greatly improved retention of students who would otherwise be leaving the university.

The BMS faculty have undertaken other efforts to improve retention such as a Freshman Seminar and a probation recovery class for second-semester students on academic probation. In an effort to reach underrepresented students, an online option has been added to many of the didactic courses. Specifically, the completion degree programs for Diagnostic Imaging and Health Sciences can be completed entirely online, allowing these programs to reach a wider variety of student populations.

## **B. Student Success**

*Standards addressed in this section:*

*i. There are sufficient resources to meet program needs for assisting students.*

All students in the BMS Program are provided with opportunities for advisement and assistance. Within the CHS, there is a Student Services office with one academic advisor, Bill Mueller, dedicated to the BMS undergraduate majors. This advisor communicates and meets regularly with the Undergraduate Program Directors to review student progress, curricular issues, and student advisement.

Mr. Mueller ensures that students are kept on track academically, encouraging students to meet with him at least once each semester. The BMS undergraduate program directors work closely with Mr. Mueller to monitor advising practices and keep him informed of curricular and programmatic changes. The BMS program directors and coordinators also provide guidance to students and offer open advising/walk-in advising to students as needed.

In addition to face-to-face contact, information regarding program policies and procedures is available via other sources (e.g., BMS and CHS websites, program brochures, catalogs, student handbooks, and policy manuals). E-mails and other updates are regularly provided to students in an effort to keep them apprised of deadlines, anticipated program changes, and other relevant information. The students contacted during the site visit spoke positively of the advising program and noted Mr. Mueller's effectiveness in helping students navigate the complexities of transfers and major changes.



Each BMS sub-major offers a Professional Development course where students are encouraged to join their professional organizations, develop a résumé and cover letter, practice interview skills, discuss job-search strategies, and attend professional society meetings where they prepare and present posters on relevant professional topics. These courses are often taken during the spring semester of their senior year. During the senior year, students often begin the interview process for job placements prior to graduation. Many students are offered job opportunities prior to graduation. This was the case for all the students we met during the site visit.

Experiential learning opportunities occur within laboratory sessions on campus and during internships at clinical affiliates. In addition, students are also encouraged to participate in undergraduate research within the department. Several BMS students have completed UWM's Support for Undergraduate Research Fellowship (SURF) program.

**Conclusion:** The standard addressed in this section is met.

**Recommendation 6:** The BMS faculty understand their community mission and the importance of retention and degree completion to that work. Their efforts are exemplary and should continue.

## **6. Plans for the Future**

The program has concrete and feasible future plans that are aligned with up-to-date healthcare workforce needs (e.g., adding an Advanced Diagnostic Medical Imaging course), and should increase enrollment (e.g., finalizing MLT-MLS bridge bachelor's degree). They also suggested a creative way to deal with the lack of funds for the labs. However, the College or UWM's central administration should provide funds to purchase updated technology in the labs, as it is vital to keep up with the technology that the program's graduates will encounter in employment settings. Furthermore, the program should be allowed to hire tenured or tenure-track faculty soon to provide more stability and foster the growth of the program.

Despite facing challenges such as a lack of funds and a decline in faculty lines, the program is performing exceptionally well, and we are confident that the program will continue to attract many students in the future. Our recommendations aim to maintain the program's strength and contribute to its further improvement.

### **Summary of Recommendations:**

- 1.** The BMS program should continue.
- 2.** BMS needs support from the University to upgrade its laboratory equipment, so that it keeps up with changes in clinical technology. The self-study is very clear that the necessary funds total \$10-12,000, a number that pales in comparison to the number of students produced by the program who find ready employment in the local area.
- 3.** The BMS program should continue its ongoing and successful efforts to update the curriculum, so that students' education remains relevant to the current and future healthcare environment.
- 4.** The BMS program should develop an assessment and evaluation plan for non-accredited submajors.

**5.** Considering its high potential for growth, the department should be a high priority for the allocation of tenure lines in the coming years. The BMS program is stable at its current level of staffing, but even one departure could jeopardize this situation.

**6.** The BMS faculty understand their community mission and the importance of retention and degree completion to that work. Their efforts are exemplary and should continue.