

# The Medical Diagnostics Major: Gateway to Medical School and Physician Assistant School

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**Abstract** Medical diagnostics, offered at the University of Delaware College of Health Sciences, represents a novel major in higher education. This major incorporates courses similar to the preclinical content of professional schools along with the standard science and mathematics prerequisites. Students have the option of taking a pre-physician assistant (PA) concentration or non-pre-PA concentration. Students in the non-pre-PA concentration typically apply to medical or dental school, while students in the pre-PA concentration apply to PA school. The medical diagnostics major began in 2013 in a 2+2 format. Students completed prerequisite courses in their first two years and then applied to the permanent major, medical diagnostics. In 2021, the format for both concentrations transitioned to a direct admissions model. A study was conducted with the goal of ascertaining if there was an increase or decrease in enrollment from 2020 to 2021. Results of the study indicated a ten percent increase in enrollment for Medical Diagnostics pre-PA and a nineteen percent decrease in enrollment for Medical Diagnostics non-pre-PA. This paper outlines the critical role of the pre-health advisor for students who plan to apply to medical school or PA school as well as administrative procedures associated with a 2+2 model compared to a direct admissions model.

**Keywords:** *self-determination theory, pre-health advisor, medical diagnostics curriculum*

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## 1. Introduction

*Medical diagnostics* is a broad term employed across multiple disciplines of medicine and can be described as the use of an assay or technology to aid the clinician in diagnosing and treating patients. Recently, medical diagnostics has emerged as a cogent major in higher education, providing students with a uniquely venerable foundation in medically oriented courses where they are taught the etiology, pathophysiology, clinical manifestations, diagnostic testing, and treatment of disease. As this program originated at the University of Delaware, the scope of information will reflect that institution's advising practices. In the medical diagnostics major (non-pre-PA concentration), students envision applying to medical school or dental school and take General Biology, Microbiology, Calculus, General Chemistry, Organic Chemistry, Anatomy and Physiology, and Physics in their first two years of undergraduate study. In their final two years, medically oriented courses are completed. These

include Hematology, Clinical Physiological Chemistry, Medical Microbiology, Human Genetics, Molecular Biology, Immunology and Virology, and Immunoematology (Figure 1). In the medical diagnostics pre-physician assistant (PA) concentration, students take many of the same courses as in the non-pre-PA concentration with notable differences (Figure 2). Pre-PA students take General Psychology, Healthcare Ethics, and Nutrition; they do not need to take Physics I and II and may take Pre-calculus instead of Calculus. Gaining acceptance to medical school or PA school is predicated on stellar academic performance, patient contact hours, volunteering, and leadership experiences. The pre-health advisor is an essential advocate in not only articulating a strategic course plan throughout the students' undergraduate years but also communicating healthcare opportunities, standardized testing resources, and meeting intricate timelines. This paper will describe how the pre-health advisor plays a pivotal role in helping students stay on a successful trajectory in achieving their goal of applying to medical school or PA school in the nascent medical diagnostics major.

## MEDICAL DIAGNOSTICS NON-PRE PA CURRICULUM

### Major Requirements:

Second Writing Requirement

Mathematics (MATH114, MATH115, MATH117, MATH221, or MATH241)

English Course: any ENGL course  $\geq$ 200 level

Additional Breadths: Either Creative Arts & Humanities (3) or History & Cultural Change (3),

Social & Behavioral Science (3)

### Pre-requisites

BISC207 Intro to Biology I: (4)

BISC208 Intro to Biology II: (4)

BISC300 Intro to Microbiology: (4).

CHEM103/133 or 107 Gen Chem I: (4)

CHEM104/134 or 108 Gen Chem II: (4)

CHEM321 Organic Chem I: (3)

CHEM325 Organic Chem I Lab (1)

CHEM214 Elementary Biochem: (3)

CHEM322 Organic Chem II: (3)

CHEM216 Organic Chem II Lab (1).

BISC276 Human Physiology: (4)

PHYS201/221L Intro to Physics I: (4)

PHYS202/222L Intro to Physics II: (4).

MMSC200 Language of Medicine (3)

MMSC100 Intro to Med Lab Science

STAT200: Basic Statistics (3)

### Core Courses:

MMSC360 Immunology (3)

MMSC402 Body Fluids (1)

MMSC407 Clin Chem I (3)

MMSC409 Immunohematology I (2)

MMSC420 Immunohematology II (2)

MMSC423 Hematology I (2)

MMSC433 Hematology II (2)

MMSC428 Med Microbiology (3)

MMSC436 Clin Chem II (3)

MMSC438 Diagnostic Bacteriology (2)

MMSC 462 Interdisciplinary Health (3)

MMSC490 Clin/Molec Cell Bio (3)

MMSC491 Genetics (3)

**Figure 1.** Medical Diagnostics Curriculum (non-Pre PA) (<https://www.udel.edu/academics/colleges/chs/departments/mms/undergraduate-programs/medical-diagnostics/>)

## MEDICAL DIAGNOSTICS PRE PA CURRICULUM

### Major Requirements:

Second Writing Requirement

Mathematics (MATH114, MATH115, MATH117, MATH221, or MATH241)

English Course: any ENGL course  $\geq$ 200 level

Additional Breadths: Either Creative Arts & Humanities (3) or History & Cultural Change (3),

Social & Behavioral Science (3)

### Pre-requisites

BISC207 Intro to Biology I: (4)

BISC208 Intro to Biology II: (4)

BISC300 Intro to Microbiology: (4).

CHEM103/133 or 107 Gen Chem I: (4)

CHEM104/134 or 108 Gen Chem II: (4)

CHEM213 Elementary Organic Chem: (3)

CHEM215 Elementary Organic Chem Lab: (1)

CHEM214 Elementary Biochem: (3)

CHEM216 Elementary Biochem Lab: (1)

HLTH241 Ethical Aspects of Healthcare: (3)

KAAP309 A&PI (4)

KAAP310 A&P II (4)

MMSC100 Intro to Medical Lab Science (1)

MMSC200 Language of Medicine (3)

PSYC100 General Psychology (3)

STAT200: Basic Statistics (3)

NTDT 200 Nutrition Concepts (3)

### Core Courses:

MMSC360 Immunology (3)

MMSC402 Body Fluids (1)

MMSC407 Clin Chem I (3)

MMSC409 Immunohematology I (2)

MMSC420 Immunohematology II (2)

MMSC423 Hematology I (2)

MMSC433 Hematology II (2)

MMSC428 Med Microbiology (3)

MMSC436 Clin Chem II (3)

MMSC438 Diag Bacteriology (2)

MMSC 462 Interdisciplinary Health (3)

MMSC490 Clin/Molecular Cell Bio (3)

MMSC491 Genetics (3)

**Figure 2.** Medical Diagnostics Pre PA Curriculum (<https://www.udel.edu/academics/colleges/chs/departments/mms/undergraduate-programs/medical-diagnostics-pre-pa/>)

## 2. Background

In 2021, the medical diagnostics major (pre-PA and non-pre-PA concentration) transitioned from a 2+2 format to a direct admission (unrestricted) major. In the 2+2 model students declared the Medical Diagnostics Interest major in their freshmen year and applied to the permanent Medical Diagnostics major in the spring semester of their sophomore year. The rationale for this change was multifaceted, including: 1) increasing enrollment, 2) self-determination on the part of the student, and 3) increasing the likelihood of students graduating in four years. The medical diagnostics major non-pre-PA and pre-PA started in 2013 in the Department of Medical Laboratory Sciences (renamed Department of Medical and Molecular Sciences) College of Health Sciences at the University of Delaware. Based on the major's curriculum, it was asserted by department administration and faculty that the medical diagnostics major would provide a strong foundation in medically related courses for those students planning to apply to medical school or PA school. Courses common to both concentrations taken in the students' final two years include Hematology, Immunohematology, Medical Microbiology, Clinical Physiological Chemistry, Body Fluids, and Immunology, among others. In the 2+2 model, students were admitted into the medical diagnostics interest major and applied to the permanent medical diagnostics major in the spring semester of their sophomore year. The decision about accepting students was made by the Undergraduate Programs Committee (UPC) upon review of criteria, including a minimum grade point average (GPA) of 3.0 and completion of all prerequisite courses. Often, students applying for the medical diagnostics major were missing one or two prerequisites and/or were below the minimum GPA of 3.0. This iterative scenario became disconcerting among committee members because it meant the student(s) may need to pursue another major after spending two years completing prerequisites for the medical diagnostics major. Another point of contention was missing the minimum GPA by one or two points and rectifying that with the knowledge that no graduate of the program had gained entry to PA school with a GPA less than 3.0. In addition, it was agreed that the final two years of core courses were much more difficult than the first two years of prerequisites making it difficult to conceive of students raising their GPA when taking the core courses. Ultimately, the committee agreed to transition from a 2+2 model to a direct admissions model for the medical diagnostics major.

### 2.1. Solutions and Recommendations

The UPC posited that allowing students the autonomy to chart their own course given all of the knowledge surrounding what benchmarks are needed to gain entry to PA school and medical school would be best going forward.

This transition aligns with the self-determination theory (SDT) in academic pursuits, in which motivation plays an integral role. Motivation can be described as exhibiting the energy to perform a task leading to a successful outcome. The SDT evaluates people's inherent growth

predilections and innate psychological needs, posited to be the foundations of self-motivation [1]. Ryan and Deci [2] suggest that motivation levels can be placed along a continuum with amotivation occupying the far left, defined as a lack of motivation. Upward from amotivation lies extrinsic motivation, of which there are four types (i.e., external regulation, introjected regulation, identified regulation, and integral regulation). The individual is the least self-determined in external regulation, where tasks are performed to satisfy an external demand [3]. Introjected regulation is described as an individual conducting themselves in such a way as to avoid guilt or to boost their ego. Identified regulation is an autonomous form of extrinsic motivation where the individual identifies with the personal importance of a behavior. The last form of extrinsic motivation, integral regulation, conjoins individual behaviors with their values and needs and is recognized, among the four types, as the most self-determined form of extrinsic motivation. Intrinsic motivation is situated at the far right of the continuum where the task or activity is performed for the inherent satisfaction of the activity itself.

Psychological well-being also plays a role in an individual's motivation level. Students who are unencumbered concerning various stressors and exhibit personal reasons for learning are more apt to find course material more appealing and understand it at a deeper conceptual level than those who are pursuing a college degree largely because of external or introjected types of behavioral regulation [4]. An instrument used to access reasons for academic pursuits is the Academic Motivation Scale (AMS). The AMS is composed of seven subscales with four items, each on a Likert-type scale. Knowledge gleaned from this instrument serves to provide a rationale about why students pursue an academic program. In 2008, Ballmann and Mueller [1] conducted a study consisting of 222 college students in the professional phase of their chosen academic program. These included clinical Laboratory Science, Health Information Management, Nuclear Medicine Technology, Nursing, Nutrition and Dietetics, Occupational Therapy, Physical Therapy, and PA Education. Students were given a survey that evaluated particular motivation styles (intrinsic motivation to know, intrinsic motivation toward accomplishment, intrinsic motivation to experience stimulation, extrinsic motivation identified, extrinsic motivation introjected, extrinsic motivation external regulation, and amotivation). Investigators visited the campus where the study was conducted and personally delivered the survey to participants. All participants completed the survey, yielding a 100 percent response rate.

The highest motivational type identified among all participants was extrinsic motivation- identified. The majority of participants ( $n=34$ ) in PA programs were aligned to this type of motivation indicating students saw a salient nexus between their coursework and future careers. Students in medical school were not represented in the study.

The students in the medical diagnostics major at the University of Delaware are diverse in socioeconomic status, ethnicity, and level of cognitive ability. Their motivation level would likely vary across the continuum, given the many tasks they need to perform in preparation

for medical school and PA school applications. The SDT has merit and applicability to the medical diagnostics cohorts. With the help of the pre-health advisor, faculty, and program director, students can exhibit self-determination toward completing the prescribed prerequisite courses and core courses being provided with information and events that support their goal of applying to medical school or PA school. Additionally, students can be provided resources to earn patient contact hours and other activities that augment their portfolios.

### 3. Role of the Pre-Health Advisor in the Medical Diagnostics Major (Non-Pre PA): 2+2 and Direct Admission Model

From 2013 to 2020, the medical diagnostics major was structured in a 2+2 model. Students declared the medical diagnostics interest major upon entering as freshmen and completed prerequisite coursework in their freshman and sophomore years. In the spring semester of the students' sophomore year, they completed an application designed by the pre-health advisor for entry into the medical diagnostics major with a minimum GPA of 3.0. The completed application (Figure 3) was sent to the medical diagnostics program director, and decisions about students being accepted to the major were made by the UPC

consisting of the pre-health advisor and other program directors of undergraduate programs in the department. Once students were accepted to the medical diagnostics major, the pre-health advisor created an Excel file of student information to be used for sending out acceptance letters. Students who applied to the major and were not accepted also received a letter outlining why they were not accepted and other alternative majors to pursue. Where the department's academic advisor provided advising to all freshmen and sophomores, in the fall semester of their junior year, students were assigned a department faculty member for advising. This person remained the student's advisor for the remainder of their junior and senior years.

In 2021, the medical diagnostics major 2+2 model was discontinued in favor of a direct admissions model where freshmen and transfer students could automatically be in the medical diagnostics major upon acceptance to the university. As in the 2+2 model, students start taking prerequisite courses listed in Figure 1 in their first fall semester. There is no formal meeting by the UPC to deliberate on accepting students to the major in the spring semester of their sophomore year, being already in the major as freshmen. In both models, however, there are common elements the pre-health advisor articulates to students to help them stay on a successful trajectory for applying to medical school. These include information on the Medical Scholars Program, Health Professions Evaluation Committee (HPEC), Medical College Admission Test (MCAT), and study abroad programs.

#### MEDICAL DIAGNOSTICS MAJOR APPLICATION

Student Name \_\_\_\_\_

Student ID \_\_\_\_\_

Concentration Selection (check one box)

Medical Diagnostics (non-Pre PA)

Medical Diagnostics (Pre PA)

Please list any courses you plan on taking in the summer

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Add any additional information for the Undergraduate Programs Committee

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Figure 3. Medical Diagnostics Application

### 3.1. Medical /Dental Scholars Program

A medical scholars program intends to create an environment for undergraduate students infused with opportunities and benchmarks that equate to success in medical school. The University of Delaware's Medical Scholars Program allows selected students to enroll in a dual-track premedical eight-year program of study in consort with the Sidney Kimmel Medical College and Kornberg School of Dentistry at Thomas Jefferson University (Philadelphia, PA). The pre-health advisor provides guidance for medical scholars toward application procedures and program requirements. As students can apply for the program in their second semester as freshmen, it is beneficial for the pre-health advisor to provide students with this information in their first fall semester and to articulate that to be considered, students need an approximate score of 1800 on their SATs (reading comprehension, mathematics, and writing/essay), a B+ in high school studies (mathematics, science, social science and humanities, foreign language), and a GPA of 3.5 in science and non-science courses by the end of their sophomore year of college.

Initially, students attend an orientation meeting to receive information on program requirements and deadlines for submission of documentation. As students in the medical scholars program must complete

core-prerequisite courses, humanities, and social sciences courses, medical/dental practica, scholarly work, specialization in bioethics, administration and public policy, nutrition and health, or translational research, as well as college and university requirements for graduation, it is prudent that the pre-health advisor takes this into consideration when meeting with interested students when planning their course registration scheme for future semesters.

### 3.2. Health Professions Evaluation Committee

Many colleges and universities have a committee that provides a letter of recommendation after evaluating and distilling students' academic records and health-related experiences to supplement and/or meet requirements for the respective medical school's application procedures. Policies may vary across universities and colleges regarding the process and timelines employed to submit required documents and committee interviews. The HPEC at the University of Delaware provides a cogent example of a committee that evaluates students' work and healthcare-related activities before applying to medical school. It is important that the pre-health advisor inform students about the HPEC process. For HPEC to evaluate a students' academic record, they must complete a number of tasks set forth by the committee (Figure 4).

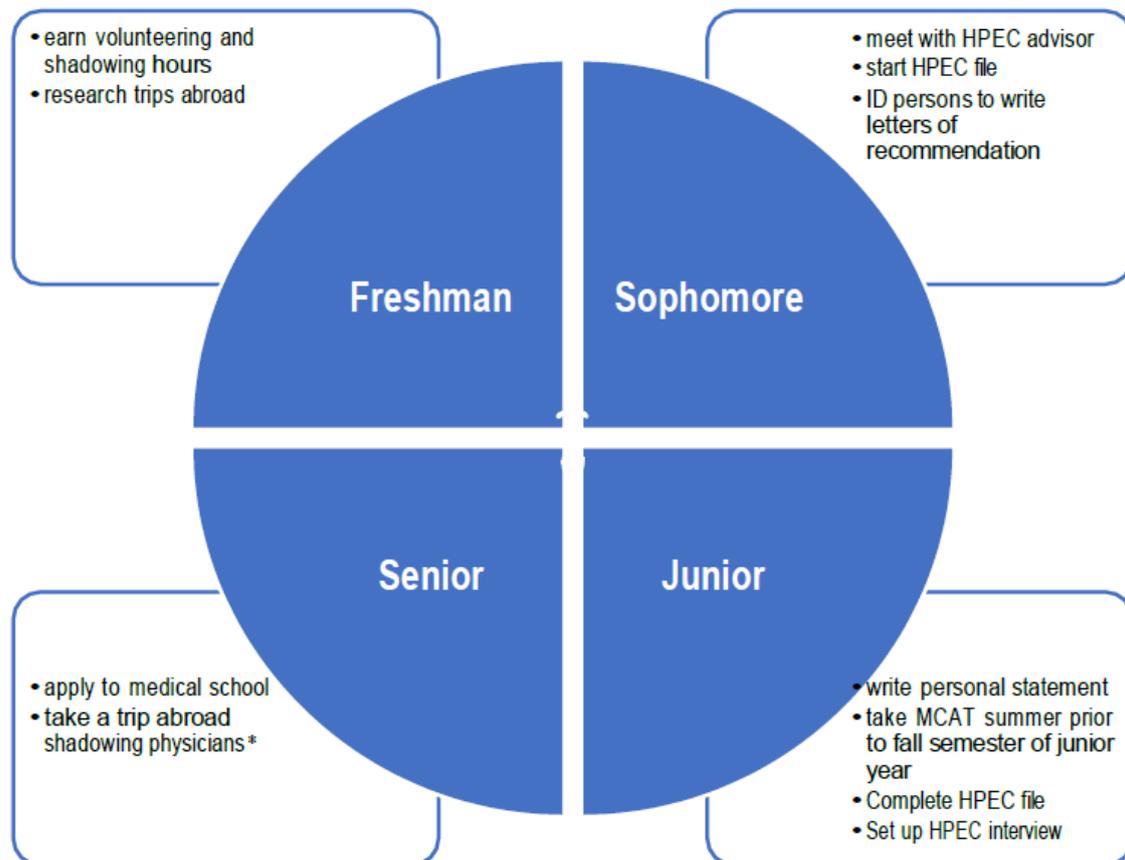


Figure 4. Activities to complete for HPEC, \*optional

Courses required for an HPEC evaluation include General Biology I and II, General Chemistry I and II, Organic Chemistry I and II, Physics I and II, and Calculus. Recommended courses include Biochemistry, Microbiology, Anatomy and Physiology, Psychology, Sociology, and

Statistics. Physician shadowing and volunteering are required for the student's file. Students must complete a minimum of fifty volunteer hours and fifty shadowing hours documented on HPEC forms. Other required items include a personal statement, resume, transcripts, headshot

picture, and letters of recommendation. The personal statement should not exceed 5300 characters and should describe the student's motivations, goals, interests, and healthcare experiences. Students must submit two letters of recommendation from their science professors, one letter of recommendation from a non-science professor, and one letter of recommendation from a physician shadowing experience. Once these items have been submitted to HPEC, an interview is scheduled between representatives of HPEC and the student, typically in their junior year. Once the interview is completed, HPEC will submit one of the following recommendations: 1) highly recommended, 2) recommended with enthusiasm, 3) recommended, 4) not recommended at this time. The committee letter captures significant pillars of the student's interest and trajectory toward the medical profession. As so poignantly described by Glen Cummings [5], postbaccalaureate program director at Bryn Mawr College, "Committee letters tell your story—your whole story, including your most significant experiences, but more importantly the evolution of your interest in medicine. You tell the story as well, or course, on your application, but the author of your committee letter reinforces the main themes in your journey through your upbringing, academic choices and achievements, activities, work, and volunteering—the steps along the way that led you to the moment of applying" (<https://students-residents.aamc.org/applying-medical-school/advisor-corner-preparing-committee-letter-process>). Other committees like HPEC that provide a letter of evaluation in support of students' medical school application are listed in Table 1. If a student's undergraduate program or university does not have a committee that evaluates students for entry to medical school, it is prudent for the pre-health advisor to articulate that not all medical schools have a strong preference for a committee letter from applicants and will not be penalized if their application is devoid of this letter [6].

**Table 1. Schools that evaluate students' portfolios and provide letters for their medical school application**

Committee	University or College
Health Professions Advising Committee	Princeton University (Princeton, NJ)
Health Professions Program Committee	Carnegie Mellon University (Pittsburgh, PA)
Health Professions Committee	Middlebury College (Middlebury, VT)
Health Professions Committee	University of Maine (Orono, ME)
Health Professions Committee	Rowan University (Glassboro, NJ)
Health Professions Committee	St. Olaf College (Northfield, MN)
Health Professions Advisory Committee	University of Houston (Houston, TX)
Health Professions Recommendation Committee	Southern Methodist University (Dallas, TX)
Pre-Health Professions Committee	University of Tampa (Tampa, FL)
Health Professions Advising Committee	Trinity College (Hartford, CT)

### 3.3. MCAT

The MCAT is a computer-based standardized assessment for prospective medical students. This

examination comprises questions about physical and biological sciences, verbal reasoning, sociocultural and psychological influences on behavior, and writing skills. Advisee to medical diagnostics majors who plan to apply to medical school is the optimum time to take the MCAT, target scores, duration and cost of the exam, and how to prepare for the exam. The MCAT content is divided into four sections: 1) chemical and physical foundations of biological systems, 2) critical analysis and reasoning skills, 3) biological and biochemical foundations of living systems, and 4) psychological, social, and biological foundations of behavior. Each section is scored from 118 to 132, with a mean total score ranging from 472 to 528. Test takers have ninety-five minutes to take the chemical and physical foundations of biological systems, biological and biochemical foundations of living systems, and psychological, social, and biological foundations of behavior and ninety minutes to take the critical analysis and reasoning skills section. Pre-health advisors can relay to students they can expect to sit for the exam for approximately 7.5 hours with optional breaks. The best time to take the MCAT is during the summer before entering junior year. The MCAT is offered about 25 times per year between January and September. The current cost is \$310. The exam is taken from the AAMC who have a number of resources to help students prepare. The pre-health advisor can communicate to students' resources such as practice examinations, diagnostics tools, and question packs. The AAMC also offers pre-health advisors a discount on these products. Kaplan is another resource for MCAT preparation, offering reference books, virtual interactive classes, and face-to-face for all sections of the examination. Most students spend between 300 and 350 hours preparing for the MCAT.

### 3.4. Study Abroad Programs

Participating in a program that facilitates healthcare experiences abroad can be very enriching to students, culturally and educationally, and increase the diversity of healthcare experiences in applying to medical school. An example of a study abroad program is the Atlantis program. The Atlantis program began in 2007 with the mission to work with the best hospitals, compete for the best students, and make medicine personal. It is of great importance to the administrators of Atlantis that every program abroad reflects a deep concern for ethical solidity, educational value, and innovative thinking to equip the next generation of global medical leaders to pursue their callings passionately. Eligibility requirements include students being at least 18 years of age and attending or recently graduated from college. Additionally, students must submit a personal statement and answer short essay questions as part of the application process. The pre-health advisor can identify webinars and workshops for students that can be helpful for students writing their personal statements, especially guiding students on what should and should not be included in the personal statement.

MedLife is another organization that facilitates travel abroad programs for students. Created in 2004, MedLife collaborates with low-income communities in Africa and Latin America to improve their access to medicine,

education, and community development projects. Students have the opportunity to shadow physicians and dentists in mobile clinics in the host country and perform triage tasks while learning how global medicine can engender positive outcomes in diverse communities. Possible destinations are Lima, Riobamba, Cusco, Tena, Kilimanjaro, New Delhi, Managua, and Esmeraldas. Communicating study abroad programs to students in advising sessions early on in the student’s undergraduate program can help students make deliberative decisions on programs like Atlantis and MedLife and what program may be best suited for them.

#### 4. Role of the Pre-Health Advisor in the Medical Diagnostics Major (Pre-Pa Concentration): 2+2 and Direct Admissions Model

In the 2+2 model, students in the medical diagnostics interest major complete prerequisites in their first two years and apply to the medical diagnostics major with a concentration in pre-PA in the spring semester of their sophomore year with a cumulative GPA of at least 3.0. Like the medical diagnostics major (non-pre-PA) discussed above, the UPC meets to decide which students are accepted to the major predicated on their GPA and completion of prerequisite courses. Once accepted, the student would receive a letter of acceptance from the program director. Students who are not accepted to the major also receive a letter explaining why they were not accepted that provides other alternative majors that may be a better fit for them. In the medical diagnostics major (pre- PA concentration) direct admission model, freshmen, and transfer students are accepted to the major upon acceptance to the university. Students complete prerequisite courses in their first two years of study as outlined in Figure 2. In their junior and senior years, they complete the medically oriented courses (e.g., Immunology, Hematology, Immunohematology, etc...). Common elements of the 2+2 model and direct admission model for the medical diagnostics major with a concentration in pre-PA include discussions between advisor and student on the acquisition of patient contact hours, Central Application Service for Physician Assistants (CASPA), the Graduate Record Exam (GRE), and the Physician’s Assistant College Admissions Test (PA-CAT). In the students’ first year, the pre-health advisor articulates the importance of identifying an activity that can lead to patient contact hours needed when applying to PA school and other activities that enhance the students’ portfolio. A few of the most common routes for earning patient contact hours include emergency medical technician (EMT), certified nursing assistant (CNA), and working in a physical therapy clinic. The pre-health advisor may communicate to advisees EMT courses in the area or close to their home and CNA classes. It is helpful for students to know the cost and duration of the course and how the course could be worked into the students’ schedules. Finding opportunities in physical therapy clinics is much more streamlined than the EMT or CNA because there typically is no formal course that needs to be

completed. The pre-health advisor could direct the student to a job’s website using the search term *physical therapy aide* in securing a position and completing training provided by the employer.

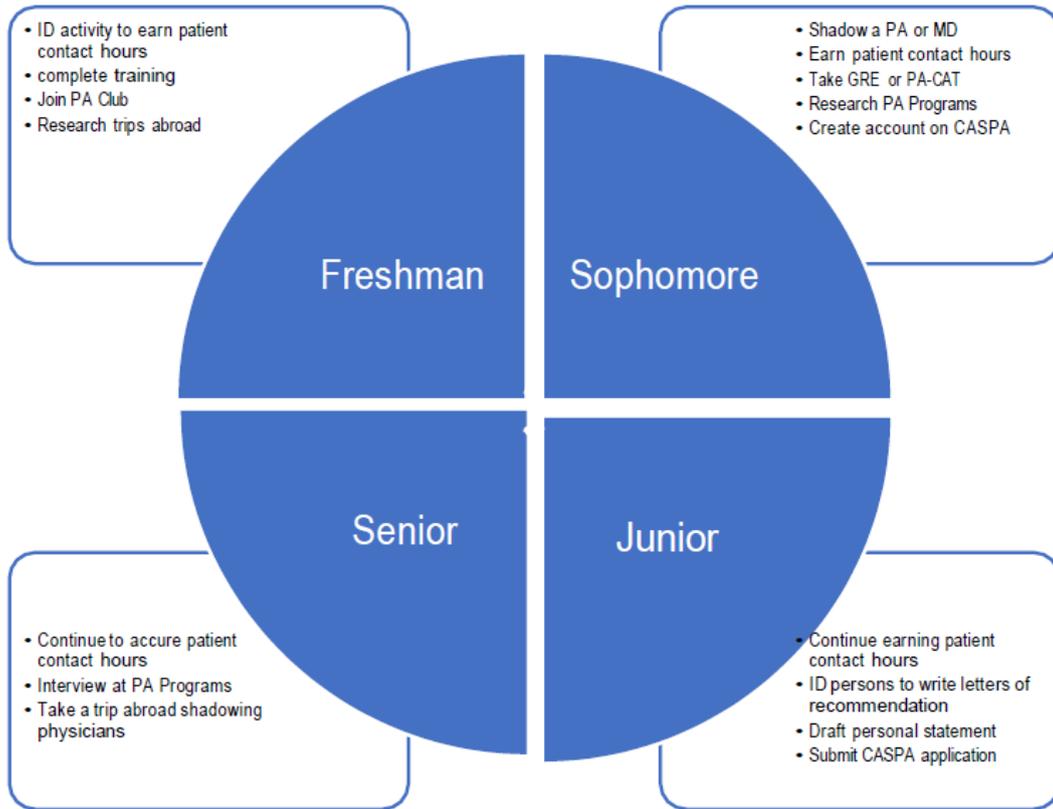
A common question from students is: “How do I document my patient care hours or healthcare experiences? The pre-health advisor can create a form for documenting hours (Figure 5) and post it on the department website listing contact information for students’ supervisors, the address of the facility, and how many hours were accrued. It is also prudent to articulate to students that patient contact hours may be voluntary, paid- position, or the result of college credit

Experience type (circle one)	Research
	Volunteering
	Patient Care
	Healthcare (non-patient care)
	Shadowing
	Leadership
	Teaching
Classification (circle one)	paid
	volunteer
	credit
Position	Title:
	Number of hours per week:
	Total Hours:
	Organization:

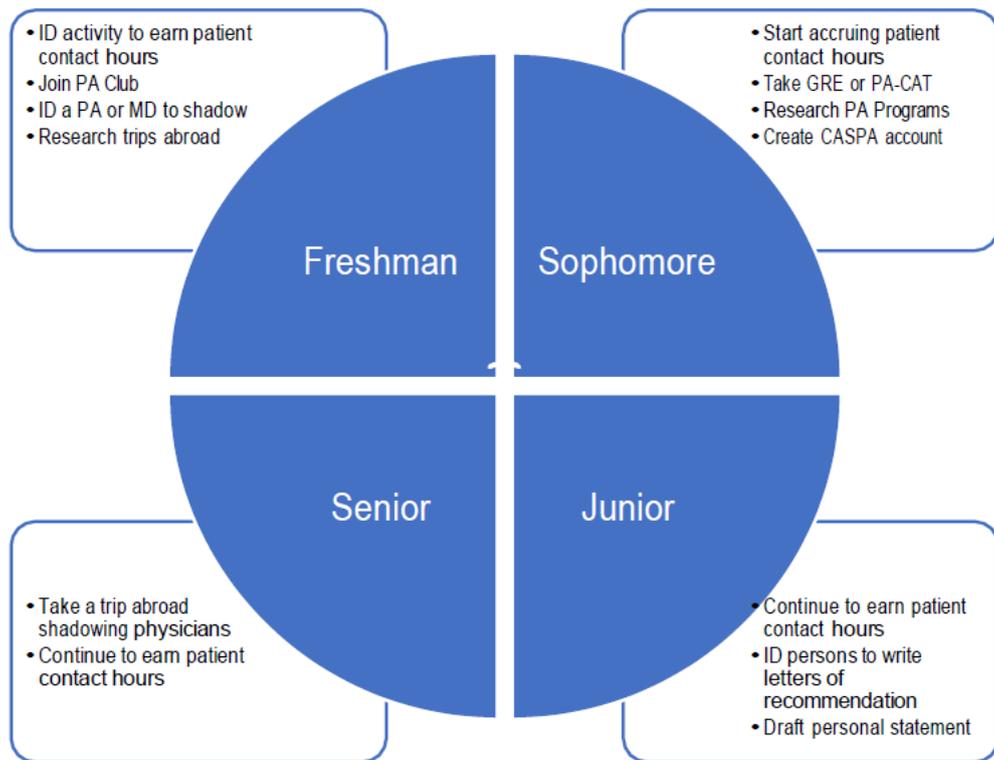
Figure 5. Form for documenting healthcare experience

#### 4.1. CASPA

The pre-health advisor also provides an overview of CASPA where students can enter contact information for individuals who they want to write a letter of recommendation on their behalf, enter courses and healthcare experiences, upload their personal statement, and COVID-19 essay (optional), and select PA programs to apply to. In addition, it is prudent for students to know that CASPA does not recognize grade forgiveness, that all grades on the students’ transcript will be used to determine the science and non-science GPA, and that the new CASPA cycle begins at the end of April each year. The date students submit their CASPA application is predicated on specific due dates by the PA school(s) they are applying to and the start of the new cycle. The pre-health advisor will also receive questions on whether students should take a gap year, allowing them time to accrue more patient contact hours and other healthcare-related activities like shadowing and medical scribing. Examples of tasks completed in preparing to apply to PA school are depicted in Figure 6 and Figure 7.



**Figure 6.** Activities to consider when applying to PA School by Class (without gap year)



-----GAP YEAR-----

Submit CASPA Application when new cycle opens at end of April

**Figure 7.** Activities to consider in applying to PA School by Class (with gap year)

### 4.2. GRE

The GRE is a standardized test created and administered by the Educational Testing Service (ETS). This examination consists of three sections: 1) quantitative reasoning, 2) verbal reasoning, and 3) analytical writing. Scoring for the quantitative reasoning and verbal reasoning ranges from 130 to 170, and scoring for the analytical writing section is 0 to 6. Scores are available in 10-15 days electronically from the student’s ETS account. The current cost of the exam is \$205 and allows for GRE scores to be sent to four programs free of charge. Students have over 3 hours to complete the exam and can be taken at a testing center or remotely. For remote testing, a webcam must show a 360° view of the room, headphones cannot be used, and a small whiteboard may be used. An on-screen calculator is provided for the quantitative reasoning section with the added capability of transferring the answer directly into the answer box. Students may also ask their advisor whether they need to take the GRE. While not all PA programs require the GRE, even if one of the PA programs the student applies to requires it, they would need to take it. Providing the student with resources for studying for the GRE and explaining that it may be beneficial to make time in their schedule for taking it twice is useful.

### 4.3. Physician’s Assistant College Admissions Test (PA-CAT)

Another assessment examination some PA schools accept is the PA-CAT. This test consists of 240 multiple choice questions taken over 4.5 hours and covers anatomy, physiology, general biology, biochemistry, general and organic chemistry, microbiology, behavioral sciences, genetics, and statistics. A scaled scoring system is employed to account for the variability of question difficulty and ranges between 200 and 800. The test taker receives two scores, a composite score and sub-scores for anatomy and physiology, biology, and chemistry. Prometric testing centers administer the exam, and the current cost is \$228. PA programs that require the PA-CAT are listed in Table 2. The PA-CAT only recently became available in 2020, and as more PA programs adopt this examination, the pre-health advisor can add these programs to their PA school documents given to advisees.

Table 2. PA Programs requiring the PA-CAT

PA Program	City, State
AdventHealth University Sciences	Orlando, FL
Central Michigan University	Mount Pleasant, MI
College of Saint Scholastica	Duluth, MN
Hardin-Simmons University	Abilene, TX
Harding University	Searcy, AR
Miami-Dade College	Miami, FL
Pfeiffer University	Misenheimer, NC
Stephens College	Columbia, MO
Theil College	Greenville, PA
Wake Forest University	Winston-Salem, NC

### 4.4. Physician’s Assistant Educational Association (PAEA) Virtual Fairs

The PAEA was founded in 1972 and represents all PA programs in the United States. Among the many events and activities, the PAEA organizes virtual fairs. In these events, students interested in applying to PA school can communicate with PA program directors and gain valuable knowledge on their requirements for admission, AP credits, internships, how assessments are delivered, the cost of the program, and other pertinent information. The pre-health advisor can provide students scheduled dates for virtual fairs and remind them prior to the event to make a list of questions to ask directors.

### 5. Changes in Student Enrollment

Cognos reports from the registrar’s website (<https://www1.udel.edu/registrar>) at the University of Delaware were analyzed to determine if there was an increase in freshmen enrollment in the medical diagnostics major from fall of 2020 to fall of 2021. In the fall of 2020, there were 78 freshmen enrolled in the medical diagnostics interest major; in the fall of 2021, 86 students enrolled in the medical diagnostics major (concentration pre-PA). This represents a ten percent increase in student enrollment. For the medical diagnostics major (non-pre-PA), there were 36 students enrolled in the fall of 2020; in the fall of 2021, this number fell to 29, resulting in a nineteen percent decrease in enrollment. These numbers will continue to be tracked as the medical diagnostic major enters its second decade. Graduates of the medical diagnostics major who are now in PA School often communicate to faculty how their degree has been a gateway to their graduate school aspirations. A few excerpts from graduates are delineated in Table 3.

Table 3. Comments from Graduates of the medical diagnostics major

Comments
<i>I am more than halfway over with the semester And I just wanted to let you know that because of the medical diagnostics major, I feel that I am cruising through the program. I have a class specifically for lab medicine, and it’s everything we have ever discussed in class, including blood typing, microbiology, ABGs, and many others. Hematology and Immunohematology here has been so easy for me because of the depth we covered in the major! Medical diagnostics pre-PA graduate class of 2019</i>
<i>This is currently my first week of medical school, and I just wanted to send you an email to say thank you! During the first week, we are learning how to identify different cells on blood smears, along with each cell’s unique function. Your hematology class has greatly prepared me for this material, and all of the questions so far have been a breeze. Medical diagnostics pre-PA graduate class of 2020</i>
<i>I just graduated from PA school as a high honors student. I felt so prepared for PA school, so thanks for always challenging us. Medical diagnostics pre-PA graduate class of 2016</i>

### 6. Conclusion

This paper focused on the role of the pre-health advisor in the medical diagnostics major and the many tasks that need to be completed by students when applying to

medical school and PA school. Thus far, the decision to transition from a 2+2 model to a direct admissions model has proved beneficial with a greater emphasis on autonomy and self-determination on the part of the student anchored to an environment of support from their pre-health advisor and other individuals invested in their trajectory of success in medical school or PA school. Conducting a study employing the AMS tool for cohorts of medical diagnostics majors would be beneficial in ascertaining their level of motivation at multiple stages in their undergraduate years. Results of this endeavor would serve to better understand what intrinsic and extrinsic factors motivate students in their chosen program respective of the SDT in the direct admissions model.

## References

- [1] Ballmann, J.M. & Mueller, J.J. (2008). Using self-determination theory to describe the academic motivation of allied health professional level college students. *J Allied Health*, 37: 90-96.
- [2] Ryan, R.M. & Deci, E.L. (2000). Intrinsic and extrinsic motivation: classic definitions and new directions. *Contemp Educ Psychol*, 25:54-67.
- [3] Ryan, R.M. & Deci, E.L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *Am Psychol*, 55:68-78.
- [4] Sheldon, K.M., Ryan, R.M., Deci, E.L. et al. (2004). Independent effects of goal contents and motives on well-being; it's both what you pursue and why you pursue it. *Pers Soc Psychol Bull*, 30: 475-486.
- [5] Cummings, G. (2021). Advisor Corner: Preparing for Committee Letter Process. AAMC  
<https://students-residents.aamc.org/applying-medical-school/advisor-corner-preparing-committee-letter-process>.
- [6] AAMC. (2021). Guidelines for writing a letter of evaluation for a medical school application.  
<https://students-residents.aamc.org/applying-medical-school/advisor-corner-preparing-committee-letter-process>.



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