

Reimagining Basic Health Science  
Steering Committee  
Report of Recommendations  
November 28, 2023

\*Department changes require approval from the State Council of Higher Education for Virginia

Dear colleagues,

On behalf of the Reimagining Basic Health Sciences Steering Committee, we offer this report, which outlines the work of the committee and its recommendations for strengthening our science enterprise, including a new model for departments. It was our privilege to serve as the selected co-chairs for this activity. The recommendations in this document represent input from the School of Medicine community members throughout the committee's process.

This report was submitted to the Dean, and we will be sharing it with various stakeholder groups, in a broad town hall and then with departments in smaller in-person discussion sessions prior to the adoption of any of the recommendations contained therein. Any decisions that involve the change in the structure of departments or graduate programs require approval from both the university and the State Council of Higher Education for Virginia.

We thank all the members of the steering committee for the time they devoted to this process, their engagement, and the work they did to gather input on behalf of their departments.

If you have any comments, questions, or concerns, you are welcome to reach out to us.

With Warm Regards,



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## SUMMARY OF RECOMMENDATIONS

- Due to attrition, many BHS departments now lack a ‘critical mass’ to support departmental activities. However, looking toward the future of research in the VCU School of Medicine, there may be advantages to reorganizing into fewer departments, rather than re-building each department as it was historically, to ensure adequate resources are in place to support faculty and growth of research in cross-sectional themes. Therefore, it is recommended that the current six basic health science departments be restructured to comprise four departments (based on SWOT analyses and other considerations) with the following suggested names: 1) Neuroscience, 2) Pharmacology and Toxicology, 3) Microbiology and Immunology, 4) Cellular, Molecular, and Genetic Medicine (other name suggestions for some departments are also noted in the report). Current SOM faculty should retain the right to choose the department that is best suited for them. Recruitment of new faculty in the 4 departments is needed to offset attrition and fill current scientific gaps.
- Due to a significant need for Informatics/Data Science within the SOM (home to numerous clinical departments with patient records), the creation of a department was highly favored by the committee (should resources and timeline be facilitated). Alternatively, this effort can be initiated in the form of a theme to be further developed into a department in the future.
- It is highly recommended that there be consideration of scientific and research alignment with VCU Health. (There are currently 110 T&R faculty in clinical departments in addition to clinical faculty with active research programs). The proposed matrix structure and the creation of horizontal themes will ensure scientific collaboration across departments in the SOM (and beyond) and support an increase in P, U and T grant success. The themes will have ‘theme leaders’ with protected time to oversee and implement the scientific growth and success of the themes. Theme leaders will work closely with department chairs to ensure adequate representation of the different themes in their departments as applicable.
- Education and Research Training comprises a very important theme that serves the entire SOM. It is essential that our educators reflect a mix of teaching specialists and content experts, to be involved in both UME as well as graduate education and training. Such education needs should also be considered by department chairs with input from theme leaders when hiring new faculty.
- Current graduate programs must be maintained until all enrolled students have graduated while future reorganization of newly developed graduate programs that align with themes and operate interdepartmentally is being planned.
- With the hope of a new research building/facility to replace Sanger Hall, there is an opportunity to organize research space based on themes rather than home departments to foster collaboration and stronger research engagement. This will also lead to healthier recruitment of new faculty and more success with P, U and T grants.

I. Introduction and Goals

a. Dean’s Charge

The Reimagining Basic Health Science Steering Committee was convened at the request of the Dean of the School of Medicine, Dr. Arturo Saavedra, M.D., Ph.D. The goals of the committee were: (1) to evaluate the current state of the basic health science (BHS) departments in the VCU School of Medicine; (2) to recommend a plan to strengthen existing departments; and (3) to plan a framework around which to align basic/translational science with research areas of particular interest to VCU Health. These research areas include Cardiovascular Research, Cancer Research, Neuroscience Research (including addiction), and Transplant Science (with emphasis on immunology). Two additional overarching goals were to break down silos between faculty in clinical departments (including teaching and research faculty) and basic science faculty, thereby facilitating team science. An additional charge was to recommend a plan that would provide space for growth and development over the next 10-15 years by validating prior work and adding a strategic lens. The Dean emphasized that this is not meant to be an optical exercise, but should produce a solid, innovative plan to build departments by focusing on the vertical structures of traditional departments and to include horizontal scientific themes that extend across departments.

b. Committee Composition

The committee was comprised of 15 Faculty spanning BHS departments, clinical departments, and education, three Senior Associate Deans, one Associate Dean, and two Department Administrators as follows:

<b>Basic Health Science Departments</b>	Hamid Akbarali Professor of Pharmacology and Toxicology	Charles Anderson Assistant Professor Physiology and Biophysics	Jason Carlyon Professor of Microbiology and Immunology
	L. Ashley Cowart <b>Committee Co-Chair</b> Professor of Biochemistry and Molecular Biology	Jose Eltit Assistant Professor Physiology and Biophysics	Kimberle Jacobs Associate Professor Anatomy and Neurobiology
	Tomasz Kordula Professor Biochemistry and Molecular Biology	Pin Lan Li Professor Pharmacology and Toxicology	Joyce Lloyd Professor Human and Molecular Genetics
	Hermine Maes Professor	Richard Marconi Professor	Dong Sun Professor

	Human and Molecular Genetics	Microbiology and Immunology	Anatomy and Neurobiology
<b>Clinical Departments (Teaching/Research)</b>	Jennifer Koblinski Associate Professor Pathology	Fadi Salloum <b>Committee Co-Chair</b> Professor of Internal Medicine (Cardiology)	
<b>Education</b>	Linda Costanzo Professor Emerita, Physiology and Biophysics (Undergraduate Medical Education)	Michael Grotewiel Professor Associate Dean for Graduate Programs	
<b>Dean's Office</b>	Betsy Ripley Vice Dean Senior Associate Dean for Faculty Affairs <b>(Executive Sponsor)</b>	Michael Donnenberg Senior Associate Dean for Research and Research Training <b>(Executive Sponsor)</b>	Cathy Wood Senior Associate Dean, Finance and Administration
<b>Department Administrators</b>	Jodi Humpage (Biochemistry and Molecular Biology, Physiology and Biophysics, Human Molecular Genetics)	Julian Owens (Pharmacology and Toxicology, Anatomy and Neurobiology)	

c. Meeting Structure

The Committee reconvened on June 21, 2023, with a charge from Dean Saavedra. At the following meeting, July 21, 2023, Drs. Fadi Salloum, PhD (Internal Medicine, Cardiology) and L. Ashley Cowart, PhD, (Biochemistry and Molecular Biology) were elected as committee co-chairs. Ratification of Drs. Salloum and Cowart occurred during that meeting and via email. Meetings continued bi-weekly through October 3, 2023. A full day retreat was held October 16, 2023. Agendas were developed by Dr. Cowart in collaboration with Dr. Salloum. Dr. Ripley advised on the retreat agenda. In general, prior meetings consisted of wide-ranging input and discussion. At the retreat, much of the information was finalized. Further communication then occurred via email and was discussed at a subsequent meeting. An effort was made to listen to all viewpoints and arrive at consensus. Points on which the committee remained undecided are noted throughout the report; in cases where there is no consensus, several options are noted.

In the interest of transparency and to promote engagement with stakeholders, Drs. Salloum and Cowart presented draft versions of the plan contained herein to various administrative groups, including the Dean's meeting with Basic Science Department Chairs, the Faculty Senate, the Executive Committee, and a School of Medicine Town Hall. These presentations occurred in October of 2023. Throughout this process there has been an emphasis on opportunities for growth, with assurances that stakeholders

are listened to, and that committee members' input has been noted and will be reflected in the report. All members of the committee were provided the opportunity to comment on this report; changes were made accordingly. The overall culture of this process has been highly collegial.

## II. Status of BHS Departments

### a. Faculty in BHS departments

Faculty in the basic health science departments are summarized below (Table 1). Note that term-track faculty who are still being mentored by senior tenured faculty are listed separately, as are faculty who do not conduct independent research, such as some Shared Resource personnel and those faculty whose primary role is in education or administration. Total BHS faculty include 119, with 83 of those tenure/tenure eligible and acting as principal investigators; similarly teaching and research faculty in clinical departments are 110.

**Table 1. Faculty in Current BHS Departments**

Department	Tenured/Tenure Eligible Faculty	Term faculty mentees	Education, Core, Administration Faculty	Total faculty	Faculty Active Awards
Anatomy and Neurobiology	12	1	5	18	\$14,839,877
Biochemistry and Molecular Biology	13	2	3	18	\$16,290,082
Human and Molecular Genetics	12	5	3	20	\$18,977,574
Microbiology and Immunology	13	1	2	16	\$16,724,598
Pharmacology and Toxicology	23	9	3	35	\$67,760,096
Physiology and Biophysics	10		2	12	\$8,698,584
<b>TOTAL</b>	<b>83</b>	<b>18</b>	<b>18</b>	<b>119</b>	

### b. State of Current Departments

The committee's first major discussion revolved around an analysis of Strengths, Weaknesses, Opportunities, and Threats (SWOT analysis) for each Basic Health Science Department. These were presented by representatives of each department after communication with department chairs. **Strengths** in each department were noted and were largely overlapping, including nationally recognized researchers, most faculty having extramural funding, and national recognition of department strengths in very specific areas (e.g, Biochemistry and Molecular Biology is internationally recognized as a center of excellence in lipid research). Specific to some departments were significant teaching contributions (Anatomy and Neurobiology), in some cases spanning various colleges across campus (Physiology), and many strong graduate programs. It was noted that Pharmacology and Toxicology is a highly ranked and well-funded department and that Microbiology investigators in the Department of Microbiology and Immunology are among some of the best funded in the entire School of Medicine.

Many of the **Weaknesses/Threats** overlapped among the departments and include the following:

- Sanger Hall

The state of Sanger Hall, where many of the BHS departments are seated, was a major concern considering recurrent incidents (flooding, power outage, etc.) that have compromised irreplaceable and valuable samples for research purposes.

- Faculty Salary Support

Though extramural funding held by individual investigators is generally good, some chairs expressed concern over the costs associated with unfunded research effort component of faculty salaries, which are currently covered by departmental indirect cost reserves. These reserves have decreased substantially over recent years and are thus unable to sustain the cost vs. current income generated. Due to the cyclical nature of grant funding this will continue to be a problem. In many cases department faculty have secured duties outside research, for example, participating heavily in the education mission and/or administration, and these areas of effort are provided salary support from other lines of funding. However, this is only a partial solution, and new models should be discussed.

- Department Shrinkage due to Attrition

Most departments have greatly reduced in size over the last 15 years due to attrition without re-investment in BHS faculty (Anatomy and Neurobiology, Biochemistry and Molecular Biology, Physiology and Biophysics, Human and Molecular Genetics, and Microbiology and Immunology). Dwindling department size has negatively impacted departments intangibly, for example, by suggesting that the SOM has not prioritized BHS research. This is exacerbated by the large number of interim chairs in these departments over prolonged periods. Moreover, several tangible outcomes of small department size were noted by the committee as follows:

- National Department Rankings of extramural funding are often not on a 'per capita' basis, giving larger departments an inherent advantage, though small departments may have excellent funding per investigator.
- A certain number of faculty (estimates around 20-25) is required for a 'critical mass' to support collaboration and foster a collegial atmosphere.
- In smaller departments with heavy teaching loads, investigators have been spread too thin. This is exacerbated by other services to the SOM including committee service. Furthermore,



in Human and Molecular Genetics, there is a specific concern that the appropriate expertise is not represented for the courses that must be taught for their degree programs.

Discussion surrounding department reorganization revealed some fears and concerns, generally addressing loss of department identity, loss of teaching opportunities (and thus resources to support faculty salaries) and maintaining department names compatible with Blue Ridge rankings. Departmental representatives were tasked with discussing the potential reorganization with their departmental colleagues and chairs and return to the committee with feedback. Major points raised by department are as follows:

**Anatomy and Neurobiology (Drs. Jacobs and Sun):**

Anatomy and Neurobiology is responsible for a great deal of teaching in the MD program. This department's strengths include abundant expertise in glia, HIV, multiple sclerosis and other degenerative diseases, addiction, and traumatic brain injury. This department has provided strong teaching support for Preclinical Undergraduate Medical Education in Anatomy, the Dental School, Physical Therapy programs, and the Neuroscience graduate program, which is a very strong program. Concerns include small numbers and a desire not to be subsumed by a department or theme solely focused on addiction, as there is much research in other areas including degenerative neurological disease.

**Microbiology and Immunology (Drs. Carlyon and Marconi):**

This department has a small but very well-funded group of microbiologists who are prominent in their fields and currently among the best funded in the SOM and VCU. The PhD program is strong and is an outstanding support for the successful faculty research programs. The Immunology side of the department, however, has suffered the most severe attrition. Though the cancer and cardiac immunology fields are growing, they need additional investments and growth. Recruitment to strengthen this department, especially in immunology research, is desperately needed, and seemingly consistent with the Dean's request for strengthening immunology in the SOM. It has been suggested that basic scientists should be recruited to support collaborations with transplant medicine, cancer, and cardiac immunology clinical faculty. Faculty are eager for renewed efforts to hire immunologists to round out that side of the department and support transplant immunology as well as cancer and cardiac immunology in collaboration with clinical faculty in themes and centers. Additionally, it would be wise to recruit microbiologists to complement current strengths; in turn, this would benefit development of program project-funded research.

Faculty in Microbiology and Immunology are resistant to a departmental name change, as the current name is appropriate for the department as it stands, and it is strongly associated with its strong PhD program as well as compatible with outside rankings.

**Biochemistry and Molecular Biology (Drs. Cowart and Kordula):** This department is internationally recognized as a center of excellence in lipid research. It was instrumental in establishing the Lipidomics and Metabolomics Core Facility, which is directed and run by Biochemistry faculty and supports strong research programs within the department, across campus, and collaboratively with national/international research programs. Historically, extramural funding in this department has been strong, and almost all faculty are currently supported by multiple extramural awards. Concerns include small departmental size and difficulty of funding faculty salaries despite strong extramural support.

Biochemistry department members expressed little attachment to the current department name or structure, and seem open to merging with smaller departments, which have current collaborators.

**Physiology and Biophysics (Drs. Anderson and Eltit):** Among the BHS departments, Physiology has one of the largest classroom teaching missions with contributions in the M.D. and Ph.D. Programs, School of Dentistry, and College of Humanities and Sciences. There are 3 structural biologists in the department, and a university core for structural biology is currently in development. An additional strength is that a state-of-the-art automated patch-clamp system is currently housed in this department, though there were concerns that this valuable resource is not being fully leveraged due to low visibility. Other concerns include leadership by interim chair(s) for seven years, which played a key role in severe attrition with no reinvestment. This has led to a decrease in national visibility. There are no resources for a departmental seminar series, and there are fears that the department will be 'erased'. There is also concern about where the John D. Bower Endowed Chair in Physiology (currently held in this department) will ultimately be held. There was no strong objection to merging with other departments or losing the current department name.

**Human and Molecular Genetics (Drs. Lloyd, Maes):** This department's assets include its strong graduate program including a long history of leading T32 and other student/postdoctoral training grants. However, like other departments, it has lost many faculty due to attrition, and it also has an interim chair. Concerns include loss of identity despite some very well-funded faculty, and also that some department members may fit better in a 'Data Science/Informatics' department rather than a department with a focus outside Human and Molecular Genetics (e.g., if this department is combined with other departments). The faculty are also concerned that due to the large amount of attrition, there may not be enough appropriate expertise for teaching in the graduate program and in other teaching platforms historically performed by the department.

**Pharmacology and Toxicology (Drs. Akbarali, Li):** This is a strong department, with very well-funded faculty, a strong graduate program, a standing chair, and a high national ranking. For this department, the major concern about realignment was that as it is currently a strong department; if faculty were moved to other departments (e.g., if some move to Neuroscience, which may be a good fit for some Pharmacology and Toxicology Faculty), that will weaken this excellent department, which the Chair and faculty have worked for years to build to its current status. There was enthusiasm, however, for participation in themes, especially the proposed addiction theme (discussed below) to improve crosstalk with other faculty.

### III. Recommendations for Department Restructuring

#### a. Rationale

The primary weaknesses of the departments largely revolve around shrinkage due to attrition, and, in some cases, long-term interim chairs. Generally, the School of Medicine is perceived as not having prioritized or invested in the BHS departments. This has led to low morale among faculty. However, as presented by the new administration (i.e., Dr. Saavedra), the committee sensed that this may be an exciting opportunity to reinvigorate BHS departments and research.

Based on the reports on each department from their respective department representatives, opinions are summarized as follows:

**1- Pharmacology and Toxicology** has an appropriate size, abundant funding, very strong ranking, and a successful graduate program. Though the SOM may benefit from increased crosstalk between Pharmacology/Toxicology faculty and other departments, this will be easily addressed

through the Addiction/Substance Abuse ‘theme’ discussed below. As it stands, there is little to be gained (and much to be lost) from changing much in this department. The departmental representatives suggested that the faculty be asked if ‘toxicology’ should remain in the name.

**2- Microbiology and Immunology** is suffering from attrition, but the Microbiology component of this department is very strong, albeit small in faculty number. It is recommended that the chair of this department would invest in hiring immunology faculty to support a ‘theme’ of transplant immunology as well as cancer and cardiac immunology (potentially, in cooperation with Massey Cancer and Pauley Heart Centers). Additionally, recruiting a small number of microbiologists that would complement current strengths would benefit development of program project-funded research, which is critical especially since microbiology research falls outside the horizontal themes outlined in Figure 2 below. This would boost faculty numbers and create a robust department. As an example, two faculty members were identified, currently in Human and Molecular Genetics, that perform microbiology research and thus may appreciate the option of moving to this department. Because of the specialized nature of this department, a fusion with any other department was considered unhealthy.

**3- Anatomy and Neurobiology** is a small department with a critical teaching load for medical school (anatomy) and other programs. Investigators in this department can participate in an addiction/substance abuse theme, but many of them work in neurodegeneration; as such, additional themes could be identified to facilitate crosstalk between this department and the clinical departments of Neurology and Neurosurgery. As with Microbiology and Immunology, because of the specialized nature of this department, a fusion with any other department would be considered unhealthy.

**4- Biochemistry and Molecular Biology** has suffered from attrition and, unlike most other departments, has a long-standing Chair. This department has been successful at hiring in collaboration with Massey Cancer Center. Due to the broad nature of the research in this department, fusion with other departments is not out of the question, and several department members are performing Neuroscience research and may potentially be shifted to a different department, should they choose to do so.

**5- Human and Molecular Genetics** has suffered from attrition and currently has an interim chair. Due to the nature of the research performed by active faculty, it would be feasible to fuse many faculty in this department into a new, broad scoped basic health science department. However, there are a few faculty who may be a better fit under a data science/informatics framework. Departmental representatives noted that graduate programs are a strength and that the department was somewhat concerned about fusion with other departments; there was a strong conviction that the term “Genetics” should occur in the name of any department that eventually will house most Genetics faculty.

**6- Physiology and Biophysics** is the smallest of the BHS departments, having suffered attrition without replacement and having been under the leadership of two consecutive interim chairs (due to retirement) for an extended period. Research interests in this department address structural biology, which aligns well with Biochemistry, and electrophysiology, which partially aligns with pharmacology. Departmental representatives indicated that these faculty had little resistance to merger or name change.

b. Results

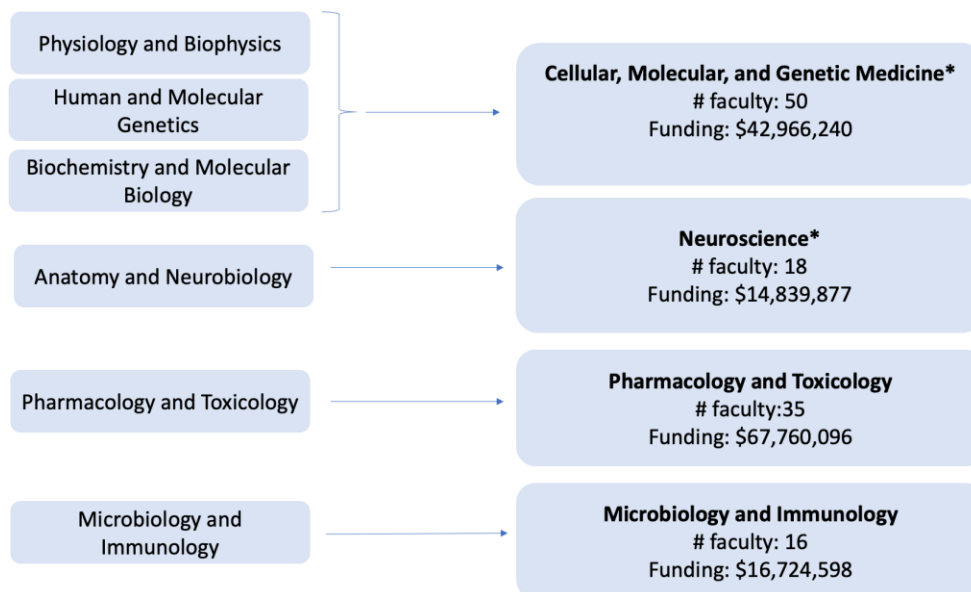
Through the SWOT analyses and follow up discussions, the committee reached consensus. The proposed new department structure is depicted in Figure 1. As described in detail below, the committee recommendation is that the current 6 BHS departments be restructured to comprise 4 departments. Neuroscience, Pharmacology and Toxicology, Microbiology and Immunology, and a new department that is potentially named “Cellular, Molecular, and Genetic Medicine.” At the retreat, the committee ‘curated’ each faculty member from a list of faculty in current basic health science departments. In summary, for Anatomy and Neurobiology (to be renamed “Neuroscience”), Pharmacology and Toxicology, and Microbiology and Immunology, faculty who are currently there can stay therein, and the new department of Cellular, Molecular, and Genetic Medicine would be comprised of faculty currently in Human and Molecular Genetics, Biochemistry and Molecular Biology, and Physiology and Biophysics. The committee unanimously and with strong conviction recommends that all faculty members retain the right to choose the department that is best suited for them.

1- Anatomy and Neurobiology: the committee recommends that it remain as it is, with investment in recruiting faculty to support the addiction theme. It is also recommended to change the name to Neuroscience. This name suggestion was unanimous, and it is noteworthy that it is NIH-recognized. It is important to note, however, that changes to academic departments, including the proposed name changes, will require approval from the State Council on Higher Education for Virginia (SCHEV).

2- Pharmacology and Toxicology: the committee recommends that it remain as it is, but it is highly encouraged to increase crosstalk with other departments in the school of medicine, particularly by interaction through the addiction theme where appropriate. A few members could be presented the opportunity to move to Neuroscience. However, strengthening Neuroscience by moving well-funded faculty currently in Pharmacology/Toxicology may weaken the department, which must be avoided as there is no net gain to the SOM. It is also recommended that the department name remain the same. Other name suggestions from the committee to be considered included: Pharmacology, Medical Pharmacology, and Pharmacology and Addiction Science.

3- Microbiology and Immunology: the committee recommends that it maintain its strong core Microbiology focus. However, it should be built up on the immunology side, both to bolster the department in general and to provide basic scientists for the transplant immunology and cancer themes as well as cardiac immunology (with Massey Cancer and Pauley Heart Centers, respectively). The committee also emphasized the importance of the department chair having a strong appreciation of immunology in order to lead the efforts and better accomplish appropriate recruitment in immunology to balance the current microbiology focus of the department. It is recommended that the department name remain the same. 4- Physiology and Biophysics, Biochemistry and Molecular Biology, and Human and Molecular Genetics: the committee recommends that these three departments be merged into a single, large basic science department. A chair should be recruited (internally or externally) for this department, which will contain over 30 faculty. This department would house numerous faculty that could participate across all scientific themes (mentioned previously and presented later). Several names for the new department were suggested including Cellular, Molecular, and Genetic Medicine, Cellular and Molecular Medicine, or Molecular Medicine. It is important to note that changes to academic departments, including the proposed name changes, will require approval from the State Council on Higher Education for Virginia (SCHEV).

**Figure 1. Recommendation for BHS departmental reorganization:**



\*Department changes require approval from the State Council of Higher Education for Virginia

Over time, lack of recruitment has led to serious decline of several departments. There have been recent efforts to recruit into BHS departments, with over 20 recruitments in the last 2.5 years. In the same time period, 16 BHS faculty have been lost to attrition. Therefore, while the recent hires offset recent losses, ongoing recruitment of new faculty must continue to occur in the near future to offset attrition.

### c. Need for Informatics/Data Science

The committee universally recognized the timely opportunity and necessity for development and implementation of informatics in medicine and biomedical research, and a major investment of resources will be required to bring VCU SOM up to date in this area. While the School of Population Health was recently created, its current focus is on biostatistics, epidemiology, and other mathematical disciplines focused on population health, and does not, to date, encompass data science or cutting-edge computer science (e.g., Artificial Intelligence, Machine Learning, etc.) as applied to medical practice and biomedical research. In addition to standard “-omics” data analysis performed as a service, data science should encompass research in Artificial Intelligence (AI) methods including machine learning, deep learning, data mining, computer vision and imaging analysis, predictive modeling, and research to develop novel algorithms enabling big data analysis. While these areas of computer science are actively being researched in the College of Engineering, some departments in the College of Arts and Sciences, the School of Business, and other entities within VCU, the School of Medicine does not currently have any unified structure that focuses on bioinformatics (AI applied to biomedical research) or medical informatics (AI applied to electronic health records) and data science.

Though the committee enthusiastically supports creation of a hub for advanced computational approaches to medical practice and biomedical research and data science, opinion on the approach has varied. This may largely be due to lack of information and common understanding, coupled with the recent establishment of the School of Population Health, which absorbed the SOM Biostatistics

Department. Two options were discussed: creation of a new SOM department of Data Science/Informatics, or, in contrast, having a Data Science theme/institute that could cut across not only departments but other Schools in the University.

#### Considerations surrounding creation of an Informatics/Data Science department within the SOM

Some committee members did not initially support creation of an informatics/data science department within the SOM. This arose largely from the cost of building a new department *de novo*, which would include recruiting a chair and hiring at least ~5 faculty. As such, the major limitations highlighted by these committee members were resources and the timeline to develop an operative department. Otherwise, members of this committee unanimously agree that adding a 'medical informatics' department is important for the SOM, provided that appropriate resources would be available and not compete with the other departments being reorganized. An additional consideration was perceived overlap with the recently created School of Population Health. Arguments in favor of creating a department within the SOM included that numerous faculty currently exist at VCU who work in these areas, and several SOM faculty may be more comfortable in an informatics/data science department rather than where they currently sit. Human and Molecular Genetics has a MS program with a concentration in Genomic Data Science, and most faculty in this department consider themselves to do Genomics, which could be built upon in the future to develop this key area. Finally, most VCU peer institutions have data science departments specific for their medical schools.

#### Considerations surrounding creation of an Informatics/Data Science Theme to cut across schools and colleges

Faculty who did not support creation of a new Informatics/Data Science department within the SOM did support creation of a horizontal theme or institute of data science to be initiated by the SOM. However, unbeknownst to the committee as deliberations began, there are several efforts across the VCU campus to create data science institutes. None of these would focus specifically on implementation of data science to biological and health-relevant human data. There is also apparently a plan by the School of Population Health to develop data science, however, the timeline for this is unclear, it is unclear if the expertise for this is present in the current administration (which is biostatistics-centric), and, finally, these efforts would likely be more focused on analysis of population health data rather than clinical data from individual patients (e.g. electronic health record review) and biomedical science data. Because much of the data is held in the SOM, a department of data science housed in the SOM to serve the needs specific to the SOM seems logical, and faculty in that department would be welcome to participate in other institutes for their own edification and development. Finally, an informal survey of faculty demonstrated that bio- and medical informatics expertise is currently represented across campus. While a few of these currently sit in the SOM, some are currently in other Colleges and Schools. It was highly advised to avoid the appearance of appropriating faculty from other schools. Investment in substantial external recruitment would be needed to develop Informatics/Data Science. Recruitment could be done from external searches.

#### IV. Vision and Recommendation for Basic Health Science alignment with VCU Health research

##### a. Rationale

While research in the VCU SOM is continually growing and strengthening, the committee recognizes that communication, logistical, and cultural barriers exist. Collaboration between BHS and clinical faculty could invigorate research and stimulate clinically relevant transformative science. Availability of samples for testing, as well as insight provided by clinical faculty

strengthens basic science. Similarly, basic science provides mechanistic insight into disease processes to potentiate the impact of clinical research. Therefore, the two approaches are both complementary and synergistic. While there are already several examples of successful BHS/clinical interaction within the SOM, collaboration can be further leveraged by creating a structure that caters to the needs of all SOM faculty members by making collaboration more accessible and welcoming. *It is notable that the clinical departments are home to 110 teaching and research faculty, and therefore they constitute nearly half of teaching and research faculty in the SOM.* Actively engaging all faculty in collaboration will better leverage the expertise in the SOM.

#### b. Matrix Structure

Matrix structures have been extensively researched both within and outside academia, and a key benefit of these structures, where hierarchical/reporting structure is distinct from productive/creative structures, is creation of collaborative excellence not in conflict with, but in cooperation with, fiduciary concerns and business processes. In the SOM, this structure could be achieved if Departments constitute the primary reporting structures ('vertical'), and Themes (which could potentially be designated Centers and Institutes if certain criteria are met) guide research direction ('horizontal') (Figure 2). The committee thus recommended the creation of horizontal Themes suggested by the Dean, which are aligned with the most pressing interests and strengths of VCU Health, including Cardiovascular Research, Cancer Research, Transplant Immunology, and Addiction Research. Importantly, with the exception of Immunology, each of these areas has abundant representation within the SOM, and a coordinated effort around a common structure could bolster these efforts. While the themes as initially stated by Dean Saavedra are most urgent, additional themes that were also suggested by committee members include Obesity and Metabolism, Neurodegeneration, Neurological Injuries or Diseases, Neuroinflammation, and Genomics.

The committee recognizes that, while faculty are placed in departments based on scientific disciplines and scientific *approaches* (Biochemistry, Pharmacology, Physiology, Genetics, etc.), faculty from across disciplines work in similar translational/disease areas, many of which are priorities for VCU Health. Interaction among these disciplines, coupled with collaboration with clinical research, would benefit research in the SOM. Therefore, a defined structure to facilitate collaborative science across departments, including clinical departments, would facilitate the development of unified efforts for impactful, health-relevant research (Fig. 2). This structure may later be further expanded to reach other Schools at VCU.

#### c. Activities of a Theme

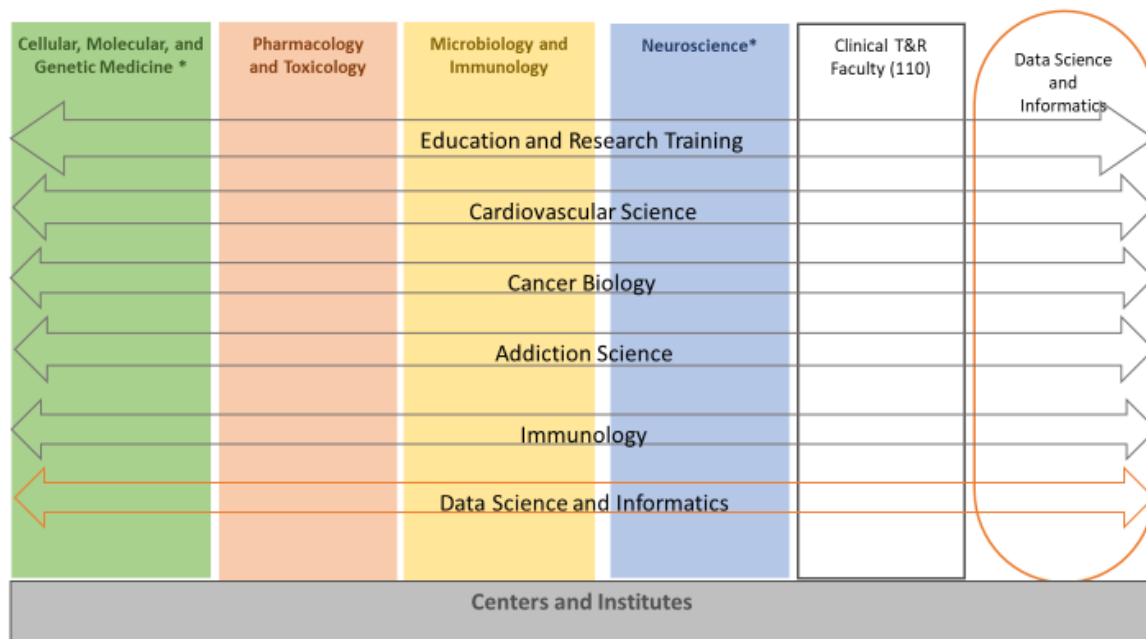
##### i. Relationship between Themes and Departments

Departments

- Be comprised of at least 20 faculty members in diverse research areas
- Chairs should work with the Education and Research Training Theme leadership to ensure that faculty who are dedicated educators actively participate in the Education and Research Training Theme
- Departments should have representatives in multiple, if not all, theme groups, where appropriate
- When recruiting, chairs should consider applicants who fit into one or more themes
- Chairs perform duties as outlined in the School of Medicine bylaws.

**Figure 2. Proposed Matrix Structure with Vertical Departments and Horizontal Theme Groups**

Data Science and Informatics is listed as both a Department and Theme as both options were discussed (please see section III.c.)



\*Department changes require approval from the State Council of Higher Education for Virginia

Themes

Themes are essentially groups of faculty from both clinical and BHS departments interested in a common disease or other area (e.g., Education and Research Training). Ideally, activities of these groups should include the following:



- A Designated theme leader
- Regular meetings
- Workshops/Seminars
- Partnering with departments to provide structured mentorship for junior faculty or other faculty without funding history
- Provide competitive pilot project funding (this could be offered strategically to serve the Dean's vision, for example, pilots requiring at least 1 clinical PI and 1 BHS PI)
- Recruitment in partnership with department chairs
- Mentorship from groups with Program Project or other multi-investigator grants for collaborative groups who wish to acquire multi-investigator grants as well as support the formulation of T grants. This effort should be supported administratively from Theme administration, which should be provided by the SOM until it is developed enough through PPGs
- Additional activities may include community outreach and public education, where appropriate

To accomplish this, each theme needs a leader to organize these activities. The committee recommended that in the first year, to start the theme organization, a minimum of 0.2 FTE support for a theme leader to devote considerable effort to envisioning theme activities and implementation. Administrative support will be necessary to bolster efforts of the theme leader. Appropriate effort beyond year 1 should be re-evaluated with SOM leadership. Theme leaders should meet with interested faculty from multiple departments as needed to brainstorm and further develop theme activities.

ii. Roles of a Theme Leader

- Maintain broad knowledge of research and research interests of theme members
- Work with clinical department Vice Chairs of Research to place teaching and research faculty into themes
- Participate in the Chairs' Interdepartmental Research Collaboration group (developed by Dr. Donnenberg)
- Organize meetings (with help of staff)
- Partner with departments to assign mentoring groups to members requiring mentorship for developing grant proposals
- Invite relevant seminar speakers
- Host relevant workshops
- Develop/maintain broad knowledge of research infrastructure, including cores
- Interact specifically with other theme leaders to develop and brainstorm ideas for themes.
- Tenure as a theme leader should be reviewed periodically, and time limits (e.g., 3-5 years) could be considered

d. The Education and Research Training Theme

While research constitutes a major focus of the SOM, education and research training are defining and fundamental missions. Each BHS department has faculty members who contribute

significantly to education, including undergraduate medical education (UME), other health professional school education, and graduate education and training. To this end, the committee envisioned an Education and Research Training Theme, whereby faculty from all departments who contribute significantly to education would be members of the education theme and would collaborate and serve as education ambassadors for their home departments. It should be required that each department have representation in the teaching theme.

The education theme will be a horizontal organization focused on all educational endeavors, including UME, other health professional schools, and master's, certificate, and PhD programs. Recruiting faculty to teach depends on department chairs in collaboration with the Dean's office and Education Theme leadership.

The Education and Research Training Theme, working with department chairs, should champion recruitment of BHS faculty who will teach in UME and other health professional courses and graduate survey courses. The BHS faculty teaching in these courses should include both teaching-specialists and content experts. (The ideal mix will depend on the discipline.) To this end, recruitments should be intentional. Recruitment of researchers should include evaluation of the researcher's interest in and potential for teaching in UME and other survey courses; this is essential to maintain the content expertise pipeline for medical and graduate courses. Any new teaching faculty must be carefully mentored (likely for several years); a formal mentoring plan must be developed with follow-up evaluations.

In the past, especially for graduate programs, teaching has been increasingly required for faculty without significant extramural funding. This can lead to situations where the individuals teaching are not the best fit. The Education and Research Training Theme can champion better placement of qualified teaching faculty and identify teaching gaps that need to be filled by new recruitments (see above). Dedicated teaching-specialists should be encouraged to participate in teaching scholarship and be supported for these efforts.

The Education and Research Training Theme should champion excellence in teaching. To that end, this theme should sponsor workshops that address critical pedagogical issues (e.g. writing well-constructed, Step 1-style multiple choice questions; designing problem-based teaching sessions; mentoring new teachers). This theme could also handle the teaching of responsible conduct of research and standards of rigor and reproducibility.

The education theme may also develop an administrative body to support T32 applications from the research themes, including maintaining training tables and other documentation common to all T32 grants. This could encourage more T32 grant submission.

#### e. Starting a Theme

To start new themes, the committee had the following general suggestions for potential criteria:

- Themes must involve multiple departments and include clinical departments
- Theme 'founders' should have a strong funding history, and, if possible, a history of collaboration evidenced by joint grant applications and/or publications
- Requiring a "nucleating" PPG may be considered, as PPGs typically have support for administrative personnel built into the core structure. While at first, administrative staff may require partial support from the SOM, additional PPGs could further build support for administrative staff, therefore not overburdening the SOM with additional administrative costs
- Students and Postdocs supported by interdisciplinary T32 should interact with the theme where relevant to their research areas (attend meetings, etc.)

The Reimagining BHS committee suggested that a committee could be formed to evaluate and approve new themes.

## VI. Recommendations for Future Reorganization of Graduate Programs

These recommendations were developed with input from Dr. Mike Grotewiel, PhD, Associate Dean for Graduate Education. There are currently 6 PhD and 6 MS programs housed within the BHS departments at the center of the realignment process. There is also the certificate program and dual degree program. It is noted that the number of PhD students is directly proportional to the number of faculty R01s, and that graduate students are essential for carrying out the work in grant

proposals. Growing the size and number of PhD programs (and to some extent MS and other programs) is critical, especially if departments grow. Most graduate programs are currently housed within a single department, however, direct alignment with a department is not required. Independent of departmental reorganization, graduate programs with current enrollment must be maintained until students have graduated.

Existing graduate programs or newly developed graduate programs should align with themes and therefore operate interdepartmentally as is our current practice overall. Programs should be structured so that students have the opportunity to interact within themes to expose trainees to multiple disciplines and involve them in team science. Such a graduate program structure might increase appeal and therefore student recruitment. The committee recommends that realignment of graduate programs be approached in the near future, but after the new departments and themes are taking shape.

## VII. **Preclinical Undergraduate Medical Education (UME):** Impact, Issues, and Recommendations

Dr. Linda Costanzo, PhD, former Special Assistant to the Dean of Medicine and Student Liaison, VCU School of Medicine, prepared the following summary reflecting the status and recommendations for UME:

### **Background for UME**

Preclinical UME courses are team-taught by faculty from across BHS and clinical departments. Most preclinical courses are multi-departmental, systems-based, integrated, and include normal structure and function, pathology, pathophysiology, and pharmacology.

The Office of Medical Education (OME) and the School of Medicine Curriculum Council, in consultation with department chairs, select course directors and teaching faculty for pre-clinical courses. UME teaching faculty are selected for subject matter expertise, teaching expertise, and ability to integrate with other course faculty. Always, the question is: who can best teach this topic (regardless of department affiliation). Evaluation of courses and faculty is conducted by OME and distributed to department chairs.

The accrediting body for medical schools (LCME) sets standards for UME, including selection and evaluation of teaching faculty.

In the pre-clinical UME systems courses, the basic science teaching disciplines are: biochemistry, cell biology, genetics, physiology, gross and microscopic anatomy, embryology, pharmacology, microbiology, and immunology. These basic science teaching disciplines usually (but not always) align

with departmental affiliation. For example, most gross anatomy in the systems courses is taught by faculty from the current Department of Anatomy and Neurobiology.

### **Principles/recommendations for UME**

1. The education theme within each new department will oversee the department's contribution to UME, graduate courses and training, and other survey courses.
2. Within the education theme, UME should be tracked separately. Planning and recommendations affecting UME must be clear and unambiguous for LCME accreditation and for the teaching mission of SOM.
3. The primary (home) department for each major teaching basic science discipline (e.g., anatomy, physiology) should be designated and be explicit. Typically, this would be the department having the most teaching faculty in that discipline. For example, if *most* gross anatomy teachers in UME have primary appointments in the new neuroscience department, *that* is the primary department. (*Some* gross anatomy teachers may have primary appointments in other departments.)
4. If a basic science teaching discipline no longer appears in a department name, the primary teaching designation must be clear to all stakeholders (e.g., OME, Curriculum Council). For example, if "physiology" no longer appears in a department name, it must be clear which department holds most physiology teachers and thus has overall responsibility for physiology teaching in UME.
5. An education lead for UME will be designated within the education theme of each department. That person interfaces with the chair, department faculty, UME course directors, and OME. The lead will also interface with faculty in other departments who teach the discipline.
6. UME education leads from each BHS department will form a consortium. The UME education consortium provides overall coordination with OME.
7. Clinical faculty and teaching/research faculty in clinical departments who teach a basic science discipline in UME should hold affiliate appointments in that BHS department. (There are already precedents for this.) They will join the education theme and increase the teaching talent pool of that department.
8. There must be a mechanism that tracks, credits and compensates all teaching in UME across BHS departments.

### **Responsibilities of BHS departments in UME**

The primary department (for each basic science teaching discipline in UME) has responsibility for:

1. Identifying teachers for relevant UME courses (in consultation with the department chair, OME, and Curriculum Council).
2. Ensuring that faculty teaching the discipline in UME have high content expertise, teaching expertise, and the ability to integrate complex subject matter with other course faculty.
3. Quality control of teaching, based on evaluations and other data.

4. Identifying needs for new faculty hires (to cover gaps created by retirements or faculty departures) and participating in recruitments. The Education and Research Training Theme, working with department chairs, should champion recruitment of new BHS faculty who will teach in UME. BHS faculty teaching in UME courses will include both teaching-specialists and content experts. (The ideal mix depends on the discipline.) To this end, recruitments should be intentional. As researchers are recruited, they should be evaluated for interest in and potential for teaching in UME; this is essential to maintain the pipeline of content expertise for UME courses. Any new teaching faculty must be carefully mentored; a formal mentoring plan must be developed with follow-up evaluations.

### **Possible "value added" to UME from BHS re-alignment**

1. The Education and Research Training Theme provides a home for educational scholarship. This could enhance educational scholarship efforts already in place in SOM.
2. There are un-developed opportunities to include BHS faculty in the clinical phase of UME. Departmental education themes could facilitate this potential collaboration.
3. Increase basic science teaching talent pool for preclinical UME (from clinical and T+R faculty).
4. Education themes in BHS departments should encourage greater participation in teaching workshops that are offered by the SOM Office of Faculty Development.
5. The education themes will formalize mentoring of new teaching faculty by experienced faculty.

### **VIII. Space and organization Recommendations**

Though space is not an explicit component of the Dean's charge to the committee, Sanger Hall emerging as a common 'weakness' in the SWOT analysis of the existing basic health science departments led to some discussion on space. If there is an opportunity for a new research facility, there was enthusiasm among the group that a new research space could be organized based on major themes rather than departments. The committee acknowledges there remain numerous unknowns and contingencies but wanted to express enthusiasm for theme/institute-organized research building rather than the current model in Sanger Hall, where each department occupies a floor. A suggestion was also made to provide groups that obtain Program Project Grants with contiguous space.

### **IX. Outcomes envisioned**

- Research, especially research by faculty in Clinical Departments, will be strengthened in collaboration with BHS faculty. Grant proposals may include more translational approaches and human data in addition to animal and cell culture models.
- Both Themes and Departments will be strengthened by joint recruitment to fill specific gaps in expertise, strengthen existing research collaborations, and build new research capacity.
- Increased collaboration will be evidenced by more P and U grants and collaborative papers.
- The Education and Research Training theme will work with other themes to increase T32 grants in theme areas to increase student recruitment and support research.
- Eventually, strong research may lead to increased patents and clinical trials (especially IITs)
- Together, these outcomes will increase the stature and visibility of the VCU SOM in the broader research community.

These expected outcomes could be used as metrics to evaluate Themes, along with robust membership across BHS and Clinical departments, increased numbers of PhD students associated with each theme, and eventually successful Graduate Programs.

This report will be submitted to the Dean and his leadership team. With their support, the committee co-chairs will present the recommendations to various stakeholder groups and broadly to the School of Medicine faculty. Follow-up discussions will be held prior to deciding upon and implementing the recommendations, including future applications to SHCEV regarding proposed changes to academic departments.