

Population Medicine in a Curricular Revision at Case Western Reserve

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Abstract

Inclusion of population medicine in a medical school curriculum has received growing attention. Recently, the Association of American Medical Colleges has highlighted this issue through support of the Regional Medicine and Public Health Education Centers initiative. The Case Western Reserve University School of Medicine joined this consortium while implementing a new curriculum in which population medicine would be an underlying theme woven with the classic science elements of disease. The organization for the first two years of the

new curriculum, which was implemented in 2006, is a six-block structure during which the basic sciences are learned with key concepts of population medicine woven throughout. The focus for this article is Block One, in which population medicine is the major emphasis of the introduction to medicine. The first week, students learn social determinants, impact on communities, and social aspects of diabetes mellitus, even before addressing a patient's clinical presentation. Emphasis on student-centered learning is undertaken as part of the new curriculum, using a series of

weekly, case-based, small-group sessions. This type of group learning is used throughout Block One as students encounter key components of population medicine. A thesis requirement was also introduced as a mechanism to emphasize research with opportunities for research in population medicine as well as other medical sciences. A variety of mechanisms are described to measure the outcomes of Block One.

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Case Western Reserve University School of Medicine embarked on a fundamental curricular revision in 2004 with two major goals: (1) to create an opportunity for every student to engage in meaningful research through a required medical student thesis, and (2) to ensure that three key areas formed the backbone of the curriculum: mastery of clinical skills, leadership, and civic professionalism. In this article, we give an overview of the curriculum and then focus on one aspect of it that emphasizes population medicine.

A New Emphasis on Public Health Education

Because understanding systems and population approaches to health care are critical to effective civic professionalism, the new dean at the time saw this as an opportunity to embed throughout this

new curriculum key components of public health.^{1–3} Working from established curricular frameworks, key elements of public health education—such as epidemiology, quantitative methods, disease prevention, quality assessment and improvement, population medicine, social determinants of disease, and health-promoting and health-damaging behaviors—were woven into the Western Reserve Two (WR₂) curriculum as the entire curriculum was undergoing change.^{2,3} The new curriculum, whose implementation began in 2006, was named WR₂ to indicate that it is the successor to the extraordinary effort in the 1950s that led the School of Medicine at Western Reserve University (now Case Western Reserve University School of Medicine) to establish a new curriculum emphasizing an organ-based-system (rather than a discipline-based) approach, with early clinical experiences.⁴ These changes formed a new blueprint for medical education that still exists today. Before WR₂, the curriculum still had many of the elements of the organ-based approach. The first year dealt with normal aspects of traditional basic science, and the second year focused on pathophysiology and disease. Although many fundamentals of

epidemiology and biostatistics were incorporated, they were focused in a two-week block of time, with no systematic attempt to return to relevant content during other parts of the curriculum. There was no research thesis requirement. Finally, the predominant pedagogical approach was the lecture, with infrequent use of small groups; the written syllabus took on iconic status, and student-directed learning received no special emphasis.

The Regional Medicine and Public Health Education Centers (RMPHEC) initiative, created by the Association of American Medical Colleges to support the insertion and integration of population medicine into medical student education, was offered at the ideal time to help the school of medicine achieve these mutual goals. Faculty leading the curricular change focused on two approaches for students to learn the key elements of public health: (1) introducing students to the field of medicine through a multiweek experience with a focus on public health, and (2) providing ongoing exposure to the elements of public health by weaving key aspects throughout the rest of the four-year curriculum. In this article, we describe the first approach, which

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established the first “block” of WR₂ to expose students to key principles of public health. This block, entitled *Becoming a Doctor*, is designed to set the stage for learning throughout the rest of the preclerkship curriculum by providing and emphasizing the importance of medicine to society as well as individual patients. In this new block, population medicine is the major focus.

The Fundamentals of the New Curriculum

The commitment to research and scholarship and the goal of integrating health and disease into a student-centered learning design offered the opportunity for sweeping curricular change. Although the key elements of the new curriculum (research and incorporation of public health) were initiated by the dean’s office, the overall design for the new curriculum was driven by a group of faculty educators. These faculty came from the office of curricular affairs as well as from existing curriculum committees. The design changes followed three basic principles: (1) learner-centered,

small-group, case-based learning should provide the mechanism for exposing students to at least 50% of the learning objectives,⁵ (2) normal structure and physiology should be taught simultaneously with abnormal structure and pathophysiology, and (3) the classic basic sciences should be presented in six blocks in which organ systems are learned in an integrated approach (see Chart 1). All blocks incorporate the identical weekly schedule, with three small-group sessions per week. Free time for self-directed learning was considered critical, so every week is also identical by having afternoons free for independent study. Preclinical basic science material is learned in Blocks Two through Six. These five blocks are preceded by a five-week introduction to the medical profession. Block One is discussed in detail in the next section of this article.

Chart 1 depicts the six WR₂ blocks, which contain the classic preclinical basic science curriculum including the sciences related to public health. These six blocks last for a total of about 18 months (includes a 10-week summer break).

Students then have an opportunity to review for the national board examination for six weeks. Once boards are completed, students may enter their clinical experiences or take the first four-month block for research and scholarship. The schedule was designed so that approximately one third of the students would be participating in their research block at a given time, allowing for a more favorable student-to-mentor ratio. An associate dean for medical student research was named, with responsibilities for identifying appropriate mentors, approving student research proposals, and evaluating the final research products. Opportunities for research in population health are identified, but work in this area is not required. The final product is a research summary in the style and length of a typical journal article. The clinical experience has also been redesigned. Six basic disciplines—medicine, pediatrics, psychiatry, obstetrics–gynecology, neurology, and surgery—are organized into two blocks of time. After these blocks, a series of advanced topics such as emergency medicine are provided. The

Chart 1
Six Blocks of the Western Reserve Two (WR₂) Curriculum at Case Western Reserve University School of Medicine, 2008*

	Block One	Block Two	Block Three	Block Four	Block Five	Block Six
	Becoming a Doctor (5wk)	The Human Blueprint (12 wk)	Food to Fuel (12 wk)	Homeostasis (12 wk)	Host Defense and Host Response (12 wk)	Cognition, Sensation, and Movement (12 wk)
		1 Week Clinical Immersion	1 Week Clinical Immersion	1 Week Clinical Immersion	1 Week Clinical Immersion	1 Week Clinical Immersion
	(Medical Error, Public Health, Inequities, Bioethics, Professionalism, Epidemiology / Biostatistics)	(Endocrinology, Reproductive Biology, Development, Genetics, Molecular Biology, and Cancer Biology)	(Gastroenterology, Nutrition, Energy, Metabolism, Biochemistry)	(Cardiovascular, Pulmonary, Renal, Cell Regulation, Pharmacology, Cell Physiology)	(Host Defense, Microbiology, Blood, Skin, Auto-immune)	(Neurology, Mind, Musculoskeletal, Cellular Neurophysiology)
		Reflection, Integration and Assessment		Reflection, Integration and Assessment		Reflection, Integration and Assessment
Structure (Anatomy, Histopathology, Radiology)	→	→	→	→	→	→
Foundations for Clinical Medicine	→	→	→	→	→	→
						Reflection, Integration and Assessment Board Review Block

* The basic science content classically taught in the first two years of medical school is distributed across six blocks in the WR₂ curriculum, which was implemented in 2006. Block 1 of the Foundations for Clinical Medicine is five weeks in length, and the other blocks generally last 12 weeks. The organ systems learned within each block are listed. Several key disciplines such as anatomy are learned as longitudinal subjects. Basic clinical skills are also introduced throughout. In addition to being the focus of Block 1, population medicine is an underlying theme woven with the classic science elements of disease throughout the remaining blocks.

clinical curriculum also started in 2006, and the details will be described in a future article.

Block One: Introducing Students to Public Health and Medicine

Block One, first introduced at Case Western Reserve University School of Medicine in 2006, was designed to be a broad introduction to the profession of medicine. Thus, it is an optimal venue to introduce students to the critical relationship between the care of individual patients and the public health ramifications of disease. The block concerns the ethos of medicine (what it means to be a physician) and includes examination of the thought processes, fundamental values, knowledge, and expertise required of today's physicians. Students in the WR₂ curriculum are introduced to health and disease within the broader context of society to provide them with a perspective and a framework for their subsequent learning of biomedical and population processes. They are introduced to such concepts as how the care of a patient raises questions across multiple domains besides that of clinical medicine, including biomedical science, society, culture, and economics; and how social and behavioral factors affect individuals and influence health and health outcomes. The block is designed to connect the patient to all other aspects of the curriculum, and it is anticipated it will inspire and motivate students to acquire the knowledge, skills, and values needed for the practice of scientific clinical medicine—in short, to become a scholarly physician.

The coleaders for Block One during its first and second iterations were an endocrinologist/health services researcher who directs the Quality Scholars Program at the Louis Stokes Veterans Affairs Medical Center (located near the medical school)⁶ and a member of the department of bioethics. Important input has come from leadership of the master program in public health as well as leaders of the city and county health departments. The block reflects the unique and distinctive methodology of the new curriculum, which embeds the principles of health and population medicine within the curriculum from the moment that students begin their work at Case Western Reserve University School of Medicine.

Drawing on the experience of the University of Virginia's three-day introduction to the basic sciences referred to as Cells to Society, WR₂ (via Block One) begins with a week totally focused on a specific disease, diabetes mellitus, and addresses aspects of this disorder from the intracellular mechanisms to the individual to society. In the first hour of "diabetes week," the societal and individual implications of this disease are explained by introducing students to the conceptual frameworks of health and disease and discussing the factors associated with the epidemic of diabetes in the atolls of Micronesia. In the first iteration of Block One, this was followed by an interview of a patient with Type 1 diabetes who was also a medical student. Students then have an opportunity to visit community agencies that offer support for individuals with diabetes as well as visit other sites with which diabetic patients might interact (e.g., a grocery store with a nutrition expert in an economically underprivileged area). Students also view in class an actual physician-led, shared medical appointment of diabetic patients and family with a health care team (nurse-practitioner-certified diabetes educator, clinical pharmacist, health psychologist, and clinic clerk).⁷ This experience allows students to appreciate several important aspects of Wagner's chronic care model, including self-management of disease and awareness of community resources.^{8,9}

During this first week of Block One, live access to the electronic medical records and decision support are demonstrated, and the use of a diabetes registry is discussed as a means for identification of patients needing attention. Public health issues such as primary, secondary, and tertiary prevention, quality of care, and system barriers to providing care are introduced in the context of this disease.¹⁰ These and other topics are reinforced later in the block and are explored again throughout the curriculum.

In the remaining weeks, students are introduced to epidemiology and biostatistics; social and behavioral aspects of health and disease (models of disease and determinants of health and disease); systems issues in health care (quality, medical error, health care disparities); classical professionalism and bioethics;

and civic professionalism—the doctor's role in society. After "diabetes week," the use of student-centered, small groups is introduced.⁵ Small groups provide an excellent opportunity for students to explore in depth issues relevant to population health in a series of four cases. Case One (described below) focuses on community-based adolescent health assessments. Subsequent cases (also described below) for the remaining weeks of Block One deal with the impact on public health of infectious disease epidemics, environmental disasters, and medical error. Lectures and intermediate-size groups are also part of the curricular schedule.

Small-group cases used in Block One

Case One. Age-specific health priorities based on risky behaviors in adolescents are the focus of this series of three small-group sessions. Students in each group are asked to design an intervention that would reduce health risks inherent in risky behaviors such as tobacco use and unprotected sexual intercourse. Relevant public health literature is used to focus discussion and to teach concepts.¹¹

Case Two. Infectious diseases are a critical problem for public health agencies to monitor and hopefully prevent. This case deals with hepatitis A and the potential that the disease was acquired in the public restaurant environment. In addition to addressing the specific disease and its mechanisms of transmission, including various scenarios of exposure, students also have to learn and apply some basic concepts of clinical epidemiology such as test sensitivity and specificity and determining the source of an outbreak.

Case Three. This case involves the scenario of an environmental disaster in the form of a heat wave occurring in northern Ohio. Modeled on actual events where there were dramatic increases in mortality in Chicago and France, the case illustrates social and behavioral determinants of mortality as well as their impact on health care systems. Students are placed in two scenarios: (1) as a physician in an emergency room, and (2) as an expert consultant dealing with policy change to reduce disparities in treatment and mortality. After the scenarios, there is an opportunity to debrief and consider how to improve the

response to a public health crisis in the future.

Case Four. Quality of health care and patient safety have been highlighted as important factors involving both individuals and systems. Case Four is based on an actual episode of surgery performed on the wrong limb. Students review the case with the expectation that they will understand a “systems” approach to adverse events and the system deficiencies at multiple levels.

Basic concepts in epidemiology and biostatistics

As noted previously, small groups are augmented by lectures and by intermediate-size groups that are led by content experts in an interactive session. For example, in a session on the relationship between human factors and patient safety, students perform usability tests on small devices.¹² In Block One, these other education methodologies are used to present major aspects of epidemiology, biostatistics, population medicine, and the public health burden of infectious diseases. Standard learning objects related to these areas are covered in these sessions.² Assigned readings prior to the large-group sessions provide the context, and postsession readings provide reinforcement and enrichment of these learning objectives. These readings include not only current literature, but also seminal publications that help students learn the epidemiologic approach to understanding the causes and prevention of disease.^{13,14}

Population Medicine as a Thread for the New Curriculum

Planning and designing the remainder of the blocks and the subsequent clinical years is ongoing. The faculty are committed to embedding critical aspects of already-learned content related to public health as well as introducing new concepts. For example, the leaders of Block Five (which covers host defense, microbiology, and immunology) are working with colleagues in the department of epidemiology and biostatistics to address infectious disease exposure and treatment and their national and global implications. Leaders of Block Six (which deals with neurology, mental health, and musculoskeletal diseases) are exploring critical content

related to behavioral health as it influences not only individuals, but also society. Block Six also addresses the challenges to care for this growing population of mentally ill patients.

Students are always encouraged to pursue issues in depth, to go beyond the basic curriculum. This applies as much to public health, including population medicine, as it does to the other more classic content of a preclinical curriculum. Public health has always been a popular area for more intensive exploration at Case Western Reserve University. As part of the school's interest in public health, students are encouraged to seek dual degrees, and a master of public health (MPH) is an option. There seems to be growing interest in this option, which may be related in part to students' exposure during their medical education to public health topics that had not previously received as much attention. Unlike many other universities that have separate schools of public health, the medical school at Case Western Reserve University oversees the MPH degree program. Through that program, faculty have organized four public health focus groups that meet regularly to discuss relevant public health issues. The RMPHEC initiative (mentioned earlier) was an opportunity to partner with local county and city health departments. Input from these departments has been extremely valuable for the focus groups. The groups spur students' interest in addressing problems in public health as the focus for their scholarly activity to fulfill their thesis requirement.

Curricular Assessment

Assessment of students as well as critical assessment of the curriculum itself were recognized as key components of curricular redesign when WR₂ was being created. To date, assessment of student learning in the curriculum has consisted of a combination of formative and summative evaluations. Whereas formative evaluation has included multiple-choice questions and short essay questions, short (one-page) essay questions designed to require critical thinking and problem solving by students have constituted the primary method for summative evaluation.

Development of methods for curricular assessment is continuing. There already is

in place a robust student survey system to seek important input from students during and at the end of each block. All students participate in the survey, and at the completion of the first iteration of Block One in August 2006, 108 students (74%) felt the overall quality of Block One was good to outstanding. Only four (3%) students rated the block as poor. There were criticisms from students particularly focused on redundancies that existed in the first version of Block One. Faculty also had the opportunity to evaluate Block One and develop an action plan. There were remarkably consistent criticisms raised by faculty and students. Many of the criticisms, particularly the redundancies, have been addressed in the second iteration of Block One, which began in July 2007. Other criticisms focused on the lack of basic science in the first five weeks of medical school. Some students also seemed uncomfortable with the student-centered approach taken in small groups.

Discussion

The social aspects of health care are receiving much attention as the United States deals with difficult issues such as the uninsured population, risk of pandemic infectious diseases, health disparities, and the rising cost of health care. Clearly, medical students should be exposed to safety and quality issues as part of their education, not only as an integral part of learning professionalism, but also to prepare them for a world of pay-for-performance and consumers' increasing demand for quality and safety information as they select their health care providers. All of these issues, although societal in nature, affect individual physicians as well. There is an appropriate, growing responsibility for universities to be leaders in solving these problems. Part of that responsibility includes educating the physicians of tomorrow about the basis of these national problems, which, frankly, are also international ones.^{2,3} Whether students will lead research efforts to devise solutions for these complex issues or practice medicine in their local communities, they have a responsibility to address these problems. Case Western Reserve University has joined other institutions that educate physicians of the future in the effort to provide at least a background understanding of these complex social issues by integrating these

issues into its curriculum using approaches established by experts.¹⁻³

One of the main goals of WR₂ is to train physicians to be problem solvers at many levels. We, like others, have committed to an intensive use of student-centered learning.⁵ Although the desired outcome of more competent physicians is difficult to prove, one study reports that physicians who experience learning in this fashion do have superior problem-solving skills.¹⁵ Our focus is going beyond the basic science years with a real goal of achieving clinical mastery during the clinical experiences.

The growing importance of public health to medical education, combined with broad curricular revision, provided an opportunity to address critical social issues in medicine. In creating Block One, we felt that the importance of basic concepts in public health could be merged with addressing the social responsibility of physicians in a unique introduction to the practice of medicine. By starting to address these critical issues from day one of medical school, we felt that students would better appreciate the importance of these basic concepts.

The school of medicine has had only two classes experience this new introduction to medical school so far. Hence, there are few assessments available at this point and only regarding the class of 2010. Detailed data on student opinion were collected at the end of the block, and for the most part it has been positive. Faculty satisfaction was mixed, as education leadership would predict in a school with a large number of both clinical and basic science faculty. Many faculty await the results of hard outcomes such as performance on Step 1 of the United States Medical Licensing Examination from the National Board of Medical Examiners.

The challenge of the future for our faculty will be to continue to engage students in public-health-related concerns in multiple contexts of the WR₂ curriculum. We will continue to use the case-based, student-centered small groups for students to learn the classic content of the basic sciences, and we will expand the case content to include relevant public-health-related issues wherever possible. These efforts will extend to the clinical experiences as well, so that when students learn to evaluate and treat individual patients, they will also learn to

address the impact of the patients' diseases on the population as a whole and understand the social basis for disease where it exists. The required thesis offers further opportunity for a subset of students to engage in rigorous investigation of these problems to discover potential solutions. Medical schools must take responsibility for educating future physicians not only in the pathophysiology of disease but also on potential prevention strategies and the impact of disease on the whole community.

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