The National Board of Osteopathic Medical Examiners (NBOME) is a not-for-profit organization whose mission is to provide “for the public welfare a means to assess competency in the healthcare disciplines relevant to osteopathic medicine.” The NBOME was established in 1934 to provide an evaluation instrument by which osteopathic physicians could seek medical licensure with full practice rights across the nation. Currently, the Board of Directors of NBOME consists of 21 members. These members are elected to the Board for their experience and expertise in the clinical and basic science disciplines, and relevant experience in osteopathic medical education and evaluation. Members of the Board come from all regions of the country, and each brings unique talents to the Board. Additionally, representatives of the American Osteopathic Association (AOA), American Association of Colleges of Osteopathic Medicine (AACOM), and the American Association of Osteopathic Examiners (AAOE) have been included to broaden the scope of membership of the Board.

The NBOME has the following standing committees: Finance, Membership, Research, Standards, Liaison, and Product. These committees meet regularly throughout the year to support the work and mission of NBOME.

The Research Committee has recently assembled an expert advisory panel that includes Barbara Plake, PhD, from the University of Nebraska; Mark Wilson, PhD, from the University of California-Berkeley; John Norcini, PhD, from the American Board of Internal Medicine; and Benjamin Wright, PhD, from the University of Chicago, MESA Psychometric Institute. The NBOME is represented on the panel by David Baron, DO, MEd (chair of the Research Committee); Thomas Cavalieri, DO (Vice President of the Board); and Linjun Shen, PhD (Director of Testing). This Research Advisory Panel guides the research efforts of NBOME.

Through the Liaison Committee, NBOME maintains communication with the schools, the students, and the state licensing boards through representation from AACOM, the Student Osteopathic Medical Association (SOMA), the Council of Osteopathic Student Government Presidents (COSGP), and the Federation of State Medical Boards (FSMB). This committee provides a forum in which concerns from these various constituencies can be presented to the NBOME Board of Directors.

Comprehensive Osteopathic Medical Licensure Examination

The primary instrument produced by NBOME is the Comprehensive Osteopathic Medical Licensure Examination (COMLEX-USA). When first administered in 1934, NBOME’s examination was in essay format. Over time, the format changed to discipline-based, multiple-choice questions. Today, the format remains multiple choice, but the examinations are multidisciplinary, containing approximately 800 questions in paper and pencil format. This instrument is based on a lifelong learning concept and was first introduced as Level 3 in 1995, which replaced the NBOME Part III exam. The first COMLEX-USA Level 2 exam was administered in March 1997, and the sequence was completed with the first administration of the Level 1 exam in June 1998. COMLEX-USA was developed through expert consensus and practice-based external studies and reflects the present-day practice of osteopathic medicine. It is a clinically oriented, problem-based examination, with an outline common to all three levels.

Because the examinations are based on the precept of maturation of knowledge and skill in osteopathic medicine, the examinations must be taken in sequence. Only students and graduates of AOA-approved colleges of osteopathic medicine are eligible to take COMLEX-USA. After successful completion of Level 1, a candidate must pass Levels 2 and 3 within 7 years. Satisfactory completion of the entire sequence enables the candidate to apply for licensure in 49 of the 50 states and the US Armed Forces. Research recently performed on the validity of COMLEX-USA by NBOME and others has developed a strong body of evidence that COMLEX-USA is valid for its intended purpose of examining osteopathic physicians for licensure.

Pass/fail standards of COMLEX-USA

The pass/fail standards of the COMLEX-USA reflect what NBOME believes is the minimum level of osteopathic medical knowledge and skills for independent practice. The COMLEX derived its pass/fail standards from criterion-referenced and experts’ judgment-based, standard-setting process. The resulting standards failed about 9%, 12%, and 7% of
first-time takers of the first administrations of Levels 3, 2, and 1, respectively. For the examinations after the first administrations, the failing rates decreased gradually by a small fraction.

To assure that the pass/fail standards of COMLEX-USA reflect the current standard of medical practice, COMLEX-USA periodically reviews its standards. Level 3 was first administered in February 1995, and the Year 2000 Level 3 Standard Setting Committee revisited its standard in early 2000. The committee was composed of 23 osteopathic physicians who were independent from the Level 3 exam development process. Committee members reviewed actual questions of the February 2000 Level 3 examination and analyzed their content in relation to medical practice according to the committee’s conceptual standard of minimal competence. The committee’s judgments were analyzed by three different methods: Rasch model–based item map approach, modified Angoff approach, and Hofstee method. Three factors influenced the final decision: NBOME’s philosophy of osteopathic medical licensure; comparison of the results from three psychometric methods; and a comparison of the new standard and the historical pass/fail rates of the Level 3 in the past 5 years. The standard established from this process resulted in 11% failing for the first-time takers of the February 2000 Level 3 exam. This standard will be held statistically consistent for all the Level 3 exams for the next 4 to 5 years.

The Level 2 and Level 1 examinations were first administered in March 1997 and June 1998, respectively. The NBOME plans to review the Level 2 standard in late 2000 or early 2001, and the Level 1 standard in late 2001 or early 2002. The review will involve analysis of the competence level represented by the current standard and a survey of osteopathic medical educators. One of the strengths of the COMLEX-USA design is that it allows a vertical comparison of the standards across the three levels. The review of the Level 1 and Level 2 standards will fully utilize this feature by comparing the standards between levels. This approach will enhance the integrity of the COMLEX-USA as a licensing examination series. The outcomes of the review will determine if the current standards should be continued or need to be adjusted.

Research efforts on COMLEX-USA

Since the implementation of the COMLEX-USA sequence, NBOME has conducted several research projects to explore the quality and features of the examinations. One of the most striking differences between COMLEX-USA and its predecessors is that COMLEX-USA is highly clinically oriented. This raised a question: Does COMLEX-USA favor, intentionally or unintentionally, the organ system–based curriculum over the traditional discipline-based curriculum? To answer this question, a study was performed to investigate if students in the two types of curriculum performed differently on the COMLEX-USA Level 1 in terms of both total score and individual item performance. The results showed that although students from the organ system–based curriculum did slightly better on the total exam than those from the discipline-based curriculum, the effect of curriculum type explained only 1% of the variance of student scores. At the individual item level, curriculum type was not a factor. These results suggest that the COMLEX-USA Level 1 is not biased with regard to curriculum type. This study also implies that, from the perspective of osteopathic medical schools, decisions on curriculum design should be based on the broader philosophy of osteopathic medical education. It would not be effective if the purpose of changing curriculum from discipline-based to system-based was solely to boost scores on COMLEX-USA.

Another feature of the COMLEX-USA is its increased osteopathic principles and practices (OPP) coverage in both depth and breadth of content. As OPP curriculum has not been standardized to the extent that concepts, procedures, and terminology used in all 19 osteopathic medical schools are completely unified and consistent, increasing the OPP coverage for the COMLEX-USA may risk a performance inconsistency of OPP items based on which school a candidate attended. Therefore, a study was designed to look at a potential bias of OPP items in the Level 1. The results demonstrated that, overall, OPP items in COMLEX Level 1 were not biased by the school a candidate attended. The implication of this study is that, even though OPP teaching may differ from school to school, the COMLEX-USA item writing, item review, and examination review processes are well established on common conceptual grounds with regard to OPP.

Among various types of validity evidence, predictive validity is the most important and convincing type. As part of NBOME’s efforts in collecting predictive validity evidence, an internal research project studied the relationship between performances on COMLEX-USA and written osteopathic postgraduate examinations. The assumption was that if COMLEX-USA measured osteopathic medical knowledge necessary for practicing medicine, examination scores should predict same candidates’ performances on postgraduate written examinations. The postgraduate written examinations study analyzed included recent certification examinations of the American Osteopathic Board of Emergency Medicine and the American Osteopathic Board of Internal Medicine, as well as in-service examinations of the American College of Osteopathic Surgery and the American College of Osteopathic Emergency Medicine. The study found high correlations between COMLEX-USA Level 3 scores and those postgraduate examinations. The results suggest that candidates who scored higher on COMLEX-USA are likely to perform better on knowledge-based examinations in the future and vice versa, regardless of specialty orientation.

Direction of future research on COMLEX-USA written examinations

Research evidence and the COMLEX-USA performances since its inaugura-
tion demonstrate that the COMLEX-USA meets the criteria for high-stakes and large-scale standardized written examinations. The focus of research efforts for the COMLEX written examinations in the near future continues to be on psychometric efficiency and effectiveness of COMLEX-USA and issues of practice-based validity evidence.

Currently, each of the three levels of COMLEX-USA contains approximately 800 items. The huge volume of items guarantees high overall reliability of the examinations. The reliability indices for the Levels 1, 2, and 3 are approximately 0.97, 0.94, and 0.93, respectively. The total number of items for the COMLEX-USA examinations is currently under review. It is possible that the COMLEX-USA may need fewer items to sufficiently cover its content specifications and still maintain satisfactory measurement precision. To explore this possibility, NBOME will simulate examinations with different lengths. Content and psychometric analyses of the simulations will follow. It is expected that this project will generate an optimal number of items for the COMLEX-USA. If a reduction of numbers of items can be supported, more resources will be able to be devoted to improving the psychometric properties of the examinations as well as the quality of individual items. Consequently, the COMLEX-USA will become a more precise measurement of osteopathic medical knowledge and will demonstrate the changes that will evolve in osteopathic medical education and practice.

Validation of the score-based inferences of an examination is a continuous process. Although the COMLEX-USA has been recognized as a valid medical licensing examination sequence, NBOME will continue its efforts toward documenting examination validity studies. A review of the literature of validity studies on the medical licensing examinations in the United States revealed that there is a relative lack of predictive validity evidence.5 Furthermore, there is virtually no medical practice–based validity evidence. To help overcome this weakness of the medical licensing exams, a focus of future COMLEX-USA validity studies will be on practice-based outcomes. A protocol has been developed, and planning has commenced for implementation next year. The research protocol outlines a study of the relationship between candidates’ performances on COMLEX-USA and their performance in residency training. This study will analyze residents’ quality of practice as well as written examination results.

Other NBOME products
The NBOME also produces the Comprehensive Osteopathic Medical Variable-Purpose Exam (COMVEX-USA). This examination is provided to the state licensing boards, at their request, for candidates whose circumstances require a relicensing examination as part of a reentry process into active osteopathic medical practice.

Several years ago, recognizing the interest that the colleges of osteopathic medicine had in assessing their students’ knowledge in individual subject areas, the NBOME introduced discipline-specific “subject examinations” that cover a broad range of basic science and clinical disciplines, including osteopathic manipulative treatment and OPP. The dean of any college of osteopathic medicine may request these examinations from NBOME. Results of the examinations with statistical analyses are returned to the school after test administration and serve as a guide to students’ performance in the tested knowledge domain.

Evolving concepts in how osteopathic medicine is being taught as well as practiced has led the NBOME to begin a process of redesigning the established subject examinations into the Osteopathic Medical Achievement Test (OMAT). In its new format, the OMAT will more closely resemble COMLEX-USA and should prove of further value to osteopathic medical schools and students alike.

Future developments
The use of computer technology in educational assessment has progressed steadily over the past several years. In particular, the exponential expansion of Web-based technology has provided computer-based testing with an improved and highly efficient distribution mechanism.

To prepare for the continuing advancement in technology, NBOME will undertake several research studies beginning in 2001. These studies will explore the feasibility of a computerized examination with standard testing formats such as multiple-choice questions and extended matching. The exploration will include uses of audio and video technology to enhance the examinations’ content. These studies will provide valuable administrative information on scheduling examinations, equipment needs, and costs to deliver a computer-based examination through an Internet-based delivery system. The primary concerns of these research efforts will be on the psychometric properties of item performance, security of content, scoring methodology, and reporting of candidate scores. The NBOME will regularly provide updated information on the progress of the studies and future plans to students and the colleges of osteopathic medicine.

Performance evaluation
Evaluation of a candidate’s clinical skills and ability takes on a new dimension with performance assessment, a new frontier in high-stakes examinations. Performance assessment enables the candidate to be evaluated in aspects of clinical skills that could not be readily measured in standard written, multiple-choice examinations. While medical knowledge may be readily evaluated in the traditional “paper and pencil” model, performance assessment allows the candidate’s attitude, behavior, procedural, and communication skills to be assessed. Performance assessment also has a unique role in evaluating the manual skills of future osteopathic physicians.

Performance assessment can be achieved through the use of standardized patients. Standardized patients are recruited and trained to simulate common clinical scenarios; with appropriate quality control measures and train-
ing, standardized patients can portray consistent and accurate clinical patient presentations. Through the use of standardized patients, history taking, physical examination, and interviewing techniques, as well as interpersonal and communication skills, can be assessed. Studies have demonstrated that use of standardized patients for the purpose of assessment can be delivered with a high degree of validity and reliability. Currently, standardized patients are used for the medical licensure examination offered by the Medical Council of Canada, and in the United States by the Examination for the Certification of Foreign Medical Graduates. It is currently in development by both NBOME and the National Board of Medical Examiners for the purpose of medical licensure of US-trained osteopathic and allopathic medical school graduates.

The NBOME has been embracing this important issue in medical licensure by its decision to develop and implement the Comprehensive Osteopathic Medical Licensure Examination-Performance Evaluation (COMLEX-PE). Although this examination is being developed to assess those skills that are critical in the primary care setting, it also incorporates assessment procedures that specifically evaluate the unique skills of osteopathic physicians.

With the appointment by the NBOME Board of Directors of a DO Director of Performance Assessment, the process for the development of COMLEX-PE is well under way. With the collaborative efforts of the case development committee, a psychometrician, and test development staff, initial cases have been developed, and pilot testing by the end of 2000 is planned. COMLEX-PE will incorporate multiple examination stations that will simulate real clinical scenarios reflective of the primary care setting. Both acute and chronic cases will be depicted, and health promotion issues will be included. Encounters may include a written exercise or an oral presentation to a physician examiner. Osteopathic principles and practice will be incorporated throughout the examination. Besides the use of standardized patients, the feasibility of incorporating real patients into the examination is also being evaluated. It is anticipated that COMLEX-PE will be fully implemented by 2004.

The NBOME is proud of its 66-year history of leadership and service as a testing organization for the osteopathic medical profession. Many challenges have been met successfully, and the future has never been brighter. The NBOME looks forward to the challenges of the 21st century and has taken progressive steps toward computerized examinations and performance-based testing. The dynamics and technology of the 21st century beckon us to continue to be the best we can be.

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