

Transition to Computer-Based Testing: The Computerization of the AMCB Certification Examination

Peggy Mancuso, CNM, PhD; Patricia Caudle, CNM, DNSc;
Gerald Rosen, PhD; Herbert Bawden

Corresponding Author: Patricia Caudle, CNM, DNSc
359 Ferguson Road
Heber Springs, AR 72543
Email: patricia.caudle@midwives.org

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Precis

The American Midwifery Certification Board (formally ACNM Certification Council) members report the planning and implementation of computer-based testing and their plans for the future.

Abstract

The year 2005 marked the first year of computer-based testing (CBT) for certification by the American Midwifery Certification Board (AMCB) (formally ACNM Certification Council). This article presents the planning and implementation of that process and compares the results of CBT for 2005 and 2006 and the paper-and-pencil tests of 2004. Plans for continued improvement of the certification process are also delineated.

Key Words

Certification examination; computer-based testing, American Midwifery Certification Board

Introduction

Computers have been used to administer examinations since the 1970s. It is only in the last decade, however, that large numbers of credentialing bodies have used computer-based testing for certification examinations.¹ On February 1, 2005 Kim LeValle, a graduate of Georgetown University, became the first candidate to become a Certified Nurse Midwife (CNM) following successful completion of a certification examination administered through computer-based testing (CBT). This article summarizes the history preceding this event and analyzes test outcomes of the first two years of CBT of the CNM Certificate Examination for Certified Nurse Midwives (CNMs) and Certified Midwives (CMs) through the American Midwifery Certification Board (AMCB), formerly known as the ACNM Certification Council, Inc. (ACC).

History of CBT, ACC and AMCB

The methods for determining fitness for practice for nurse-midwifery have varied since credentialing nurse-midwives began. The American College of Nurse Midwives (ACNM) first offered certification for entry into practice in 1971. The first examinations consisted of modified essay-type questions and were constructed by a panel of subject-matter experts.² The cut-score for passing was determined through norm referencing. That is, the cut-score, and therefore the pass-rate, were a function of the performance of the candidates who actually sat for the examination.

In 1991, the American College of Midwives Certification Council (ACC) was established as an independent organization whose purpose was to administer the certification examination. During the first four years of its existence, the ACC continued to

administer essay-type examinations. The multiple-choice format was first administered in December, 1995.³ The new format allowed for the examination of larger numbers of candidates and for the study of the exam performance of individuals and aggregates of individuals from different educational programs.

The multiple-choice examinations were prepared by subject-matter experts and were based on a content outline developed from national task analysis studies. The task analysis studies were designed to gather data about the role and current practice functions of the entry-level nurse-midwifery practitioner.

Examinations were administered three times per year at existing midwifery education programs. There were concerns about the challenge of coordination of rooms and proctors for the examinations, the effect that the uneven workload placed on staff, and examination security.

Formation and Work of CBT Task Force

On January 7, 2004, ACC convened the first meeting of the CBT Task Force. This group was composed of four CNMs, two CBT experts, the Executive Director of ACC, and a Student Nurse Midwife. Their charge was to explore the feasibility and cost of CBT for administration of the CNM Certification Examination.⁴ Concerns addressed by the task force included the following items:

- Computer skills required to take the examination
- Compatibility of CBT with the Americans with Disabilities Act (ADA)
- Ability to review previously answered questions during the examination
- The test appointment cancellation policy

- The number of available test sites in the United States and Puerto Rico
- Availability of five day per week testing throughout the calendar year
- Affordability for the candidate
- Adequacy of the test security measures

The CBT Task Force developed guidelines, produced a Request for Proposal (RFP) and submitted this document to major vendors of CBT services. Two companies responded to the RFP, and their documents were opened by the Board of Directors of ACC on April 11, 2004. Upon the suggestion of a board member, an additional potential CBT vendor was contacted and a third proposal was received. The CBT task force met on May 30, 2004⁵ and selected the top two proposals. These two proposals were submitted to the ACC Financial Committee for analysis. Following this procedure, Applied Measurement Professionals, Inc. (AMP) of Lenexa, KS was selected as the first vendor to administer the ACC Certification Examination for CNMs and CMs.

The ACC Examination Committee met in August 2004 and began the adaptation process required for CBT. The final paper-and-pencil certification examination for CNMs and CMs was administered October 14, 2004. The Examination Committee Policies and Procedures manual was revised to reflect the necessary changes for examination construction and administration in a CBT environment. In addition, the decision was made to institute pre-testing of items prior to including them as scored questions on the examination.

In 2005, the ACC changed its name to the American Midwifery Certification Board (AMCB) and began offering the certification examination via computer. In the new venue, the examination could be administered with greater ease and the results data

generated much more rapidly than ever before. The computerized examination also could be given every weekday, morning or afternoon, at over 120 sites in the United States.

Benefits of CBT to Candidates and AMCB

Computerized testing affects virtually every aspect of examination administration and test development. Through use of CBT technology, a wide array of content can be assessed efficiently and economically. Typically, computerized test administration takes place at established commercial testing center staffed by personnel specifically trained for the purpose. A critical feature of this type of computerized testing is that there is a specialized entity, the computerized testing services agency or vendor, which has direct control over the staff and sites. This vendor makes testing available on a five or six day per week basis and schedules appointments for candidates. At any given time within a commercial computerized testing center, one can see examinations from several different testing programs being administered simultaneously to candidates seated at individual, partitioned workstations. Administering examinations at commercial CBT centers affects candidate convenience, candidate costs, test development costs, organizational costs, organizational control, and security.

Candidate Convenience - The more often examinations are available and the more sites at which they are administered, the more convenient it is for candidates. This is true of examinations offered in any form; oral, practical, paper-and pencil, or computerized. For examinations with more critical consequences for candidates, increased availability becomes more important. Rather than requiring a six week lead time for an examination that is administered only three times a year, candidates can schedule their examination

with as little as two weeks lead time, and take the examination at the most convenient time and location. Testing on demand can have very positive consequences. Candidates passing their tests can go to work sooner, work force shortages may be alleviated faster, and temporary licensure, which carries the possibility of admitting to practice individuals who may ultimately prove to be unqualified, can be discontinued.

Reporting of Results - Since the computer is programmed to immediately score the examination, candidates were able to receive a preliminary score report upon completion of testing. The report included raw score, pass/fail indicator and, for failing candidates, diagnostic information. The Examination Committee decided to wait until all quality-assurance measures regarding CBT had been assessed before making the on-site, computer-generated score report an official, final notice of examination performance and pass/fail status. The decision to fully implement and evaluate a series of quality-assurance (QA) measures turned out to be a wise decision as three candidates' scores required changing from failing to passing during the first few months of CBT administration. Additional QA procedures were instituted by the AMCB Examination Committee to enhance the reliability of the score reporting process.

Candidate Costs - In general, as the number of test sites increases and as test availability increases, the fee to sit for an examination, the most direct candidate cost, tends to increase. However, candidate costs can also include travel, subsistence, lodging, and time lost from work. With more test sites, fewer candidates need to travel to other cities or states to sit for an examination, travel costs will be lower and, for many candidates, virtually eliminated altogether. Lodging and subsistence costs will similarly be reduced. Also, for many candidates, the most important benefit of increased sites and test

availability may be that it will not be necessary to disrupt their usual work schedule. This may be a convenience issue, but it can also be a significant cost issue. Income lost from missed hours or days of work may not be recoverable. In most jurisdictions, more frequent opportunities for certification through the use of CBT means that new graduates can provide care as CNMs or CMs much sooner after completing their education.

Security - In many ways security is improved through use of CBT. Stakeholders in the examination process do not have contact with the examination. Hard copies of examination booklets cannot be lost during transportation. CBT vendor employees receive training in specific procedures needed to maintain secure sites and correctly identify examination applicants. Of course, some security issues are the same for paper-and pencil testing and CBT. For example, candidates must be properly identified prior to being admitted to the examination and closely observed during the examination. Security enhancements in the CBT environment include the ability to discourage cheating by photographing and thumbprinting candidates prior to test administration and videotaping candidates while they take the examination.

Disadvantages of CBT to Candidates and AMCB

Security

Communication between candidates about test items is a threat to the validity of a certification examination. The threats to security that stem from communication between candidates are addressed in several ways. First, the candidates are placed on an “honor system” and are required to agree to maintain the confidentiality of examinations as a condition for sitting for the examination. Second, the simultaneous use of multiple examination forms makes it more difficult for candidates who violate the confidentiality

agreement to communicate reliable information to others. Finally, the ability of the computer to scramble both the order of questions within an examination and the order or positions of the four options within each multiple-choice question creates the appearance of a virtually limitless number of examinations in simultaneous use.

Other security issues involve the transmission of examinations and/or examination item banks and candidate performance data to and from test sites. Data transmission to and from testing centers and data storage at CBT test sites are highly technical issues.

Clearly, if there is any vulnerability in the transmission process, the threats to security will increase as the number of test sites increase. Increasing the availability of examinations will have a similar effect, whether examinations are stored on-site in file servers or transmitted to testing centers when candidates schedule their appointments. In either case, there will be longer periods of time during which data will be vulnerable. However, various data transmission and encryption schemes have been developed to reduce this vulnerability. In over 25 years of computerized testing by commercial vendors, there has not been a single known case of the capture of usable data by unauthorized persons either during transmissions to or from testing centers.

Organizational control - Many organizations find it relatively easy to establish an acceptable relationship with a test administration vendor that allows for development of procedures to successfully achieve the organization's testing goals. Most certification examinations for Advanced Practice Nurses are offered through the use of a commercial testing vendor, with various mechanisms in place to ensure examination security without compromising convenience to the candidate taking the test. It should be noted, however, that under paper-and-pencil testing, the sponsoring organization makes virtually all of the

rules that apply to test administration. Under CBT, it is the vendor that establishes most of the testing environment rules and procedures. Hence, a move to CBT necessarily involves a loss of some control over the testing process for the sponsoring organization.

Test Development Costs

The effect of increased test availability will be to increase test development costs for most testing programs. The reason for this is the need to minimize threats to examination security that can result from communication between candidates who have tested and those who are scheduled to test on future dates. As noted above, one way to minimize the effects of unprofessional conduct by candidates is to increase the number of test forms in use at any given time. However, doing so may mean an increase in test development efforts by the examination committee, especially when CBT is first implemented. This can mean, in turn, more frequent and/or longer committee meetings. For many testing programs, however, once the initial CBT implementation phase is complete, it is possible to return to the same test development schedule that was in place during paper-and-pencil testing.

Administrative Costs - There may or may not be any increase in administrative costs due solely to increasing the number of test sites. When a commercial computer-based testing vendor is delivering the examinations, the entire domestic network of sites is typically included in the test administration fee. These fixed-costs, however, are shared with the other testing programs using the commercial vendor's services. Hence, the additional fees often associated with CBT may be small, or, for some programs, nonexistent. Similarly, increasing test availability, like increasing test sites, may or may not affect administrative costs. When examinations are made available on demand, applicants may

take the examination throughout the year. This can have the effect of leveling administrative work-load peaks and valleys associated with administering a certificate examination several times a year. This, in turn, may lead to a decrease in the number of required staff or an end to the need for the hiring of temporary staff during the work-load peaks associated with paper-and-pencil testing.

Analysis of First Two Year's Results of CBT

Computer-based testing was fully implemented in January, 2005. The number of candidates tested during 2004, 2005 and 2006 are indicated in Table 1, 2, and 3, respectively. The total number of first-time and repeat candidates tested during 2005 was less than the previous year under paper-and-pencil administration (see Tables 1 and 2).

{Insert Table 1 and 2} One possible contributing factor for the difference is the approach of candidates to testing. Under CBT, they have greater flexibility in scheduling their examination dates. With significantly more opportunities to take the examination available to them, candidates are under less stress to fulfill the requirement of passing the examination within their two-year term of eligibility. In previous years, however, there was more pressure, real or perceived, to take the examination during one of only three administrations per year.

Table 3 indicates the number of candidates tested in 2006. {Insert Table 3} In 2006 the total number of candidates tested increased to 392, as compared to 351 in 2005. A comparison of the data in Table 4 and Table 5 shows that there was also a difference in the performance of both first-timers and repeaters under computer-based testing versus paper-and-pencil administration, with both candidate groups making an improvement in their pass rate. {Insert Table 4 and 5}

In 2006, the pass-fail rate began to more closely approximate that of paper-and-pencil testing and has remained fairly stable (see Table 6).{Insert Table 6} This trend characterized by a change to a new exam format and a temporary increase in pass rates was observed when ACC changed from essay questions to multiple-choice questions. The current pass-fail rates remain consistent with those other high-stakes, advanced practice nursing examinations.

Plans for Future

The AMCB is continually working to up-date and enhance the certification process. This year, the Research Committee of the AMCB will be conducting a task or practice analysis survey of all new graduates.⁶ This will replicate task analyses that have been completed in the past and the results will be the basis of a new content outline or blueprint for the certification examination. The provision of official, rather than preliminary score reports immediately following testing remains a goal. The continued analysis of examination questions allows for assurance that the questions used are valid and reliable. Soon, all scored questions appearing on examinations will have been pretested and have known acceptable performance characteristics. At that time AMCB will consider the benefits and risks of reporting an immediate, official pass-fail decision to the candidate.

Conclusion

The first two years of CBT administration of the AMCB certificate examination have proceeded without major difficulties. Judging from comments received from the various stakeholders, including candidates and education program directors, the transition to CBT

is definitely successful. Because of the relatively small numbers of candidates who take this examination, AMCB has been cautious about relating success or failure of the certificate examination to demographic or educational variables. As the numbers of candidates who complete CBT increases, AMCB could begin to cautiously report demographic and educational variables as they relate to exam performance. This process will be facilitated by the concurrent Task Analysis being instituted by the Research Committee. We look forward to being of future service to the midwifery community and the women and their families who are the recipients of our care.

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6. American Midwifery Certification Board Meeting Minutes, April 20-22, 2006.

Table 1

Candidates Tested by Paper-and-Pencil Administration in 2004			
	First-Timers	Repeaters	Total
Jan.	84	22	106
June	217	26	243
Oct.	60	30	90
Total	361	78	439

Table 2

Candidates Tested by Month - 2005			
	First-Timers	Repeaters	Total
Jan.	1	0	1
Feb.	21	6	27
March	20	10	30
April	8	0	8
May	8	6	14
June	67	5	72
July	77	0	77
Aug.	27	6	33
Sept.	8	5	13
Oct.	29	7	36
Nov.	16	5	21
Dec.	15	5	20
Total	297	54	351

Table 3

Candidates Tested by Month - 2006			
	First-Timers	Repeaters	Total
Jan.	28	4	32
Feb.	20	5	25
March	20	6	26
April	12	4	16
May	14	5	19
June	57	7	64
July	42	9	51
Aug.	39	14	53
Sept.	23	7	30
Oct.	28	5	33
Nov.	13	9	22
Dec.	11	10	21
Total	307	85	392

Table 4
Paper-and-Pencil Pass-Fail Results - 2004

Candidate Group	Pass Rate (#/%)	Fail Rate (#/%)
First-Timers	297/82.3	64/17.7
Repeaters	37/47.4	41/52.6
All Candidates	334/76.1	105/23.9

Table 5
CBT Pass-Fail Results - 2005

Candidate Group	Pass Rate (#/%)	Fail Rate (#/%)
First-Timers	268/90.2	29/9.8
Repeaters	36/66.7	18/33.3
All Candidates	304/86.6	47/13.4

Table 6
CBT Pass Fail Rates 2006

Candidate Group	Pass Rate (N/%)	Fail Rate (N/%)
First-Timers	254/82.7	53/17.3
Repeaters	46/54.1	39/45.9
All	300/76.5	92/23.5

Biographical Sketches (1-2 sentences that include name, title, and current affiliation)

Dr. Peggy Mancuso, PhD, CNM
American Midwifery Certification Board Member
Faculty (or Associate Professor)
Texas Woman's University

Dr. Gerald A. Rosen, PhD, is a licensed psychologist with a doctorate in Measurement, Evaluation and Techniques of Experimental Research from the University of Pennsylvania. He has worked in testing since 1971 and with licensure and certification examinations since 1983.

Mr. Herbert Bawden is a licensed psychologist and owner of Personnel Research Center, a firm of consulting psychologists. He has worked in the field of testing since 1969 and in a consulting capacity with national and international licensure and certification programs since 1984.

Dr. Patricia Caudle, DNSc, CNM
American Midwifery Certification Board Member
Faculty
Frontier School of Midwifery and Family Nursing

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