NCLEX® Overview: Psychometrics and Test Development

Nicole Williams, MSN, RN-BC
Nursing Content Manager, Examinations

Ada Woo, PhD
Director of Measurement and Testing, Examinations
Objectives

By the end of the session, participants will be able to:

1. Discuss the relationship between the NCLEX® Practice Analysis and NCLEX Test Plan
2. Identify the purpose of conducting an unintentional bias review
3. Discuss the purpose of the standard setting procedure
What is the NCLEX®?
NCLEX® Processes

Development + Maintenance + Measurement → NCLEX
Outline

- Development
  - Practice Analysis
  - NCLEX Test Plan
  - Other development activities

- Maintenance
  - Pool rotation
  - Ongoing item review
  - Keeping the exam current

- Measurement
NCLEX® Development
Practice Analysis

- Analyze the on-the-job behaviors of the incumbent
- Job analysis
- Results used to develop the NCLEX Test Plan
NCLEX® Text Plan

- Developed from the most recent practice analysis results
- Guides NCLEX content delivery for every exam
- Serves as a study guide for candidates
Two Versions of the Test Plan

Basic Test Plan
- Content distribution
- NCLEX integrated processes
- Administration
- Confidentiality

Detailed Test Plan
- Content distribution
- Nursing content examples
- NCLEX item after each test plan category
- Computerized Adaptive Test (CAT) principles
- And more
NCLEX-PN® Content Distribution

2014 NCLEX-PN® Test Plan

- Coordinated Care, 19%
- Safety and Infection Control, 13%
- Pharmacological Therapies, 14%
- Psychosocial Integrity, 11%
- Physiological Adaptation, 10%
- Reduction of Risk Potential, 13%
- Basic Care and Comfort, 10%
- Health Promotion and Maintenance, 10%
New for the NCLEX-RN® in 2016

- Available on ncsbn.org:
  - Basic Test Plan: August 2015
  - Detailed Test Plan: December 2015
  - [https://www.ncsbn.org/1287.htm](https://www.ncsbn.org/1287.htm)
- Minor edits
- 138 Activity Statements
- An additional NCLEX Integrated Process
- New NCLEX-RN® test plan takes effect on April 1, 2016
NCLEX-RN® Changes in 2016

- **Basic Care and Comfort**
  - Added: Recognize complementary therapies and identify potential contraindications (e.g., aromatherapy, acupressure, supplements)

- **Pharmacological and Parenteral**
  - Added: Handle and maintain medication in a safe and controlled environment

- **Reduction of Risk Potential**
  - Deleted: Provide intraoperative care
NCLEX® Integrated Processes

- Nursing Process
- Caring
- Communication and Documentation
- Teaching and Learning
- Culture and Spirituality
NCLEX® Integrated Processes (Continued)

- *Culture and Spirituality* – interaction of the nurse and the client (individual, family or group, including significant others and population) which recognizes and considers the client-reported, self-identified, unique and individual preferences to client care, the applicable standard of care and legal instructions.
NCLEX-RN® Content Distribution

2016 NCLEX-RN® Test Plan

- Management of Care, 20%
- Physiological Adaptation, 14%
- Pharmacological and Parental Therapies, 15%
- Basic Care and Comfort, 9%
- Psychosocial Integrity, 9%
- Safety and Infection Control, 12%
- Health Promotion and Maintenance, 9%
- Reduction of Risk Potential, 12%
- Basic Care and Comfort, 9%
- Physiological Adaptation, 14%
Item Development

- Item Writing
- Item Review
- Sensitivity Review
- Differential Item Functioning (DIF) Review
- Regulatory Body Review
Item Writers

- Qualified nurse volunteers
- Actively teaching entry-level nursing students
- Create test questions (items) based on the current NCLEX Test Plan
- Have not participated in nursing licensure exam development in the past two years
Item Reviewers

- Qualified nurse volunteers
- Actively working with entry-level nurses providing care to clients
- Review test items for accuracy, currency and entry-level appropriateness
- Have not participated in nursing licensure exam development in the past two years
Unintentional Bias Reviews

- Sensitivity Review
  - Pretest
- DIF Review
  - Pretest
  - Operational
Unintentional Bias Reviews (Continued)

- All items are reviewed to ensure the exclusion of sensitive, unintentional biased language.
- Items are edited to remove words or phrases which may affect exam measurement.
Unintentional Bias Reviews (Continued)

Criteria
- Stereotypes
- Inflammatory material
- Language
- Assumptions
Editorial Review

- Grammar
- Clarity
- Punctuation
- Spelling
- A single voice
Regulatory Body Review

- Conducted biannually
- Review criteria
  - Entry-level appropriateness
  - Nurse act congruency
- Comments forwarded to NCLEX Examination Committee (NEC)
Oversight Committee Review

- NCLEX Examination Committee (NEC)
  - Comprised of nurse regulators in various jurisdictions
  - Develops and maintains NCLEX policies
  - Reviews and approves all NCLEX items before used in scoring
  - Determines item dispositions
Additional Information

- NCLEX Webinar Series – Item Writing and Item Review
  - [https://www.ncsbn.org/4565.htm](https://www.ncsbn.org/4565.htm)
- NCLEX Item Development Opportunities
  - [https://www.ncsbn.org/exam-volunteer-opportunities.htm](https://www.ncsbn.org/exam-volunteer-opportunities.htm)
NCLEX® Maintenance
NCLEX® Maintenance

- Pool Rotation and Maintenance
- Item Review
- Content Currency
Pool Rotation

- NCLEX item delivery pool schedule
- Review activities prior to pool deployment
Item Review and Maintenance

- NCLEX review is cyclical and continuous
- Occurs at each segment of the item development process
- Items are reviewed with each operational pool deployment
- All other items reviewed at least every four years
Content Currency

- Changes in nursing content
  - Items are edited and returned to the beginning of the process
  - Item masking
- Continuous Practice Analysis
  - Practice analysis is conducted quarterly in off years
  - Practice is analyzed for changes
NCLEX® Measurement
Recap

- Development
- Maintenance
- Measurement
  - DIF and Readability
  - Standard Setting
  - Item Pretest
  - Computerized Adaptive Test (CAT)
Differential Item Functioning (DIF) and Readability Analyses

- Purpose
- DIF procedure
- Readability criteria
Fairness Review

- In order to ensure fairness of the NCLEX, additional review processes are conducted:
  - Differential Item Functioning (DIF) analyses – compare item performance of two groups of candidates, adjusting for candidates’ ability
  - Readability analyses – assess level of reading ability required
Differential Item Functioning (DIF)

- Difficulty of an item should only be reflective of nursing content measured.
- It should not be contingent upon factors irrelevant to nursing practice.
- Regardless of the other factors, the difficulty of an item relative to the other items should remain the same.
The Concept of DIF

Male  \[\rightarrow\]  Female

Harder  \[\uparrow\]  Easier

Easier for Females

Easier for Males

Easier  \[\leftarrow\]  Harder
Differential Item Functioning (DIF) (Continued)

- If an item shows a statistically significant amount of DIF, it is reviewed by a DIF panel to determine if there is an identifiable problem with the content.
- If the panel determines that there is bias, the item is reviewed by the NCLEX Examination Committee.
Readability

- The relative ease or difficulty with which a reader understands text
- Readability analysis is performed on all operational item pools
- When reading ability is not part of the construct of interest, reading demands should be kept at the lowest level possible
Readability (Continued)

- Fry Readability Index from 1993 to 2003:
  - Uses sentence length and the number of syllables per word.
- Lexile® framework from 2003 to present:
  - Uses word familiarity (frequency with which the word is used in the English language) as indicator of word difficulty.
  - Ranges from 0L to over 2000L.
  - Higher Lexiles represent more difficult reading levels.
Readability (Continued)

- NCLEX criteria:
  - NCLEX-RN not to exceed 1300 Lexiles
  - NCLEX-PN® not to exceed 1200 Lexiles
- Non-nursing books with readability range similar to the NCLEX:
  - *Animal Farm* by George Orwell – 1170L
  - *The Swiss Family Robinson* by Johann David Wyss – 1260L
Standard Setting

- What is standard setting?
- Procedure
- Panel of Judges criteria
NCLEX® Passing Standard

- In conjunction with the triennial practice analysis cycle, the passing standard is reviewed and reconsidered every three years along with the revision of the NCLEX Test Plan.
What is Standard Setting?

- Standard setting is a process that determines the minimal amount of knowledge, skill and ability that is required for entry-level practice.
Importance of Standard Setting

- If standard is set too low, unqualified nurses will be licensed.
- If standard is set too high, competent nurses will be denied entry to the profession.
- Set appropriate standard while referencing the criterion.
Why One Passing Standard for All NCSBN® Test User Areas?

- Same meaning of minimal competence
- Portability of results
Standard Setting

- The NCLEX passing standard is a point on the ability continuum that the candidate must EXCEED in order to pass the exam.
- It is the minimum ability required to safely and effectively practice entry-level nursing.
- NCSBN Board of Directors (BOD) determines the passing standard.
Board of Directors Considers…

- History of the passing standard and candidate performance on the NCLEX since 1994
- Results of a standard-setting exercise by a panel of judges
- Information describing the educational readiness of high school students who expressed an interest in nursing
- Results of annual survey of nursing employers and educators
Panel of Judges (POJ)

- An important aspect of criterion-referenced standard setting is the composition of POJ.
- A POJ representative of the nursing profession is crucial in establishing validity of the resulting passing standard recommendation.
POJ Recruitment Criteria

- Represent all NCLEX Test User Areas
- Hold current unencumbered license in the jurisdiction where they practice
- Currently employed in clinical practice providing direct care and working with entry-level nurses
- Represent areas of specialization where newly licensed nurses are often employed
- Faculty members must be teaching students in a clinical setting
- With the exception of entry-level incumbents, panelists must have at least two years of nursing experience
Pretest Items

- Every item is pretested before being placed in the operational pool.
- Statistical data are gathered on each pretested item.
- Data are used to evaluate items and ensure all operational items are accurate and fit the testing model.
Pretest Items (Continued)

- 15 pretest items on every NCLEX-RN
- 25 pretest items on every NCLEX-RN
- Randomly intermixed with operational items in the beginning of the exam
- Not used to estimate the candidate’s ability
- Used for maintaining item bank inventory
- Indistinguishable from operational items for candidates
Item Difficulty

- In a computerized adaptive test, items are targeted to a candidate’s ability.
- In order to target items to a candidate’s ability, the difficulty of the item must be known in advance.
- To get the maximum amount of candidate information per item, the computer attempts to select items for which the candidate has a 50% chance of answering correctly.
Computerized Adaptive Test (CAT)

- Variable length exam
- Content balancing
- Exam stopping rules
What Is An Adaptive Test?

- Difficulty of each item is tailored to the person taking it.
- The computer re-estimates the candidate’s ability after every answer.
- With each answer, the candidate’s ability estimate gets more precise.
- Algorithm selects an item the candidate should find challenging.
Tailoring the Examination

- Reduces the number of easy items that high-ability candidates receive
  - Easy items tell little information about a high performer’s ability
- Reduces the number of difficult items that low-ability candidates receive
  - Candidates guess on items that are too difficult
Variable Length

- The number of questions candidates receive on their exam depends upon their ability:
  - Longer length exam – ability is “close” to the passing standard
  - Shorter length exam – ability is “far” from the passing standard - clearly above or clearly below
Content Balancing

- To ensure each exam conforms to Test Plan specifications, the item selection algorithm:
  - Determines what content area deviates the most from the test specifications
  - Selects an item from that content area at the appropriate difficulty level to administer next
NCLEX® Using CAT

For additional information on CAT please visit the website: www.ncsbn.org/1216.htm
Sample NCLEX-RN®
Pass-Fail Decisions

- All CAT exams need a set of stopping rules.
- For the NCLEX, comparison to the passing standard starts with the 60\textsuperscript{th} operational item.
- No decisions regarding a candidate’s pass-fail status are made until:
  - At least 60\textit{ operational} items have been answered.
  - The exam has conformed to current NCLEX Test Plan percentages.
Stopping Rule #1 – 95% Confidence

- If the computer is 95% confident of passing after 60th operational item – PASS.
  - If candidate ability is clearly above the passing standard, the candidate passes, the exam ends.
- If the computer is 95% confident of failing after 60th operational item – FAIL.
  - If candidate ability is clearly below the passing standard, then the candidate fails, the exam ends.
Sample NCLEX-RN®
Minimum Item Fail Chart
Sample NCLEX-RN®
Medium Length Pass Chart

Pass

Begin Evaluation

Fail

Pass
Stopping Rule #2 – Maximum Length

- Candidates with abilities very close to the passing standard will receive maximum length examinations.
- Computer disregards the 95% certainty requirement.
- Outcome depends on whether the final ability estimate is **ABOVE** or **BELOW** the passing standard.
  - **ABOVE** = Pass
  - **AT** or **BELOW** = Fail
Sample NCLEX-RN®
Maximum Length Fail Chart
Stopping Rule #3 – R.O.O.T.

- Candidates who run-out-of-time (R.O.O.T.) before reaching either one of the previous two criteria.
- If the candidate’s estimated ability has been consistently ABOVE the passing standard on the last 60 items – PASS.
- If their estimated ability falls to or below the passing standard even once – FAIL.
Sample NCLEX-RN®
Ran-Out-Of-Time Pass Chart

Last 60 ability estimates are Above Passing
Evaluate last 60 ability estimates
Ran Out Of Time

Start Evaluation
Pass
Fail
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180
Objectives

By the end of the session, participants will be able to:
1. Discuss the relationship between the NCLEX Practice analysis and NCLEX Test Plan
2. Identify the purpose of conducting an unintentional bias review
3. Discuss the purpose of the standard setting procedure
Thank you!