

Evidence-Based Nursing (EBN) and Diagnostic Accuracy in Electronic Health Records (EHR)

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My topic this morning is accuracy of nurses' diagnoses and its relation to Evidenced-based nursing (EBN) and electronic health records.

With the reality of the electronic health record worldwide, nurse leaders must address the accuracy of nurses' data interpretations in order to achieve EBN practice.

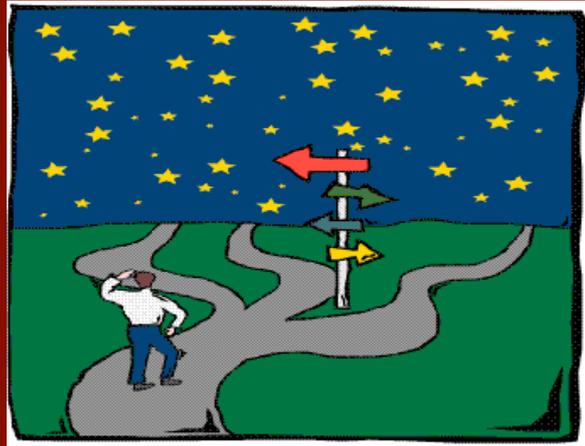
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- 1) describe the research evidence related to diagnostic accuracy;
- 2) explain the impact of diagnostic accuracy in an EHR;
- 3) Propose strategies to improve diagnostic accuracy.

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Assumption: Nursing interventions to help people are based on data interpretations.



-A basic assumption is that all nursing interventions are based on data interpretations. For example, even if a nurse decides to help a patient change positions in bed, it is based on the nurse's interpretation of patient data that the patient needs to move.

- Every data interpretation, however, has the potential to be less accurate than it should be to actually help patients. I became interested in the concept of accuracy, for example, when I was a home care nurse. When other nurses visited my patients, they tried to teach them about what they already knew. Patients later complained to me that the nurses' teachings confused them, rather than helped them. I started to realize that nurses can easily misinterpret patients' problems and needs, thus providing interventions that are not helpful.

Data interpretations may not be accurate enough to guide the selection of interventions.



Research findings have substantiated that data interpretations may not be accurate enough to guide the selection of interventions.

The goal for nurses is to match data interpretations with the individual, family or community's experiences or responses to health problems and life processes.

But, people are unique and their responses to their environment are unique.

We do not know other people, so it is complex and difficult to interpret other people's responses.

Nursing diagnoses are data interpretations of human responses, e.g., Carlson-Catalano, 1997

- Disturbed Thought Processes
- Stress Overload
- Social Isolation
- Sleep Deprivation
- Chronic Low Self Esteem
- Ineffective Coping
- Fatigue
- Ineffective Denial
- Hopelessness
- Ineffective Role Performance
- Powerlessness
- Ineffective Parenting
- Decisional Conflict

This list is an example of some of the human responses that are nursing diagnoses in the NANDA-International classification.

This is also a list from a qualitative research study of the responses of 8 women who had been battered in the past by their husbands. The researcher spent about 3 hours with each woman to identify their responses to battering and their health problems.

Each of these women were already being treated for the medical diagnoses of broken bones, headaches, and gastrointestinal problems, but this list of their responses adds significantly more information about their health status. Don't you think so?

In this study, these women also identified how nurses could help them with interventions.

Accuracy is a rater's judgment of the degree to which a diagnostic statement matches the cues in a patient situation (Lunney, 1990).

- + 5 Highly accurate, a priority & precise match
- + 4 Close to accurate
- + 3 Represent the general idea
- + 2 Reflects some cues but not highly relevant cues
- +1 Reflects only one or a few cues
- 0 Not supported by the evidence
- 1 Evidence says it is not accurate

The concept of accuracy of nurses' diagnoses of human responses was first described by me for my doctoral research; concept development was published in 1990. I described accuracy as a continuous variable from high to low because the phenomena that nurses diagnose overlap with one another. For example, anxiety and fear significantly overlap and they require different interventions, so if the best diagnosis is fear, anxiety would be close but not right on target.

If the best diagnosis was fear, a general diagnosis such as ineffective coping might be scored at level 3.

Level 2 on the 7 point scale is for diagnoses that have sufficient evidence but they are not the priority at this time.

Level 1, 0 and -1

At least 5 studies have substantiated that nurses' diagnoses of clinical cases can be scored on these 7 levels.

Example: Case study by Cavendish



I am now going to use the written case study of Craig C to illustrate the various diagnoses that might be made by nurses and how they would be scored for accuracy using this scale.

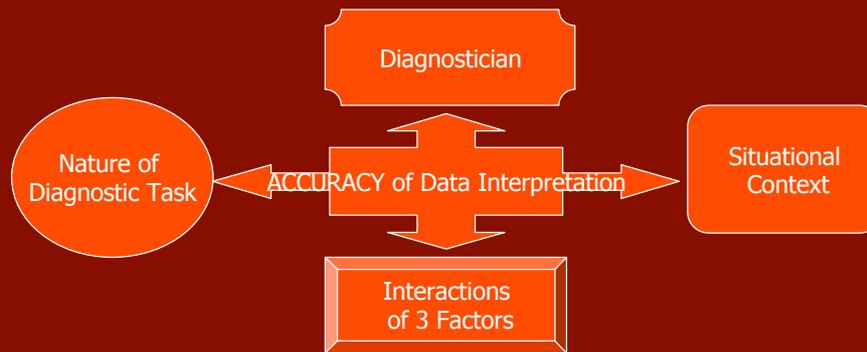
Using the 7-point scale to rate the accuracy of nurses' diagnoses of the Craig C case study.

- +5 Ineffective breathing pattern
- +5 Ineffective Airway Clearance
- +4 Respiratory Distress
- +3 Altered Respiration
- +2 Anxiety (before treatment)
- +1 Situational Low Self Esteem
- +1 Activity Intolerance
- 0 Asthma, couldn't breathe right

This is how the author rated various nursing diagnoses that might be made from this case. In the follow-up to this case, the author tried to show school nurses that they need to be concerned about the accuracy of their diagnoses.

The nurses' diagnoses pertaining to ineffective breathing pattern and airway clearance were needed because this was what the nurse needed to intervene for. Asthma was scored as 0 because it does not add any information. He always has Asthma but does not always have Ineffective Breathing Pattern. When the nurse intervened for these two diagnoses, they were resolved.

Theory: Factors in 3 categories affect the accuracy of nurses' diagnoses.



The influencing factors for variations in accuracy were identified by two nurse theorists, Doris Carnevali and Margery Gordon. These were categorized as 3 types of factors:

the Nature of the diagnostic task

the Situational Context, and

the Diagnostician

Also I added the interaction of factors within these 3 categories

I will briefly discuss what we know about the influence of these 3 categories on accuracy. For a more extensive review of the literature, see Lunney 2008a.

Research Findings: Nature of Diagnostic Task

- Relevance of data
 - High, moderate, low relevance
 - ↑ Amounts of low relevance data →
↓ accuracy
- Amounts of data
 - # of cues that apply to a diagnosis
 - Restricted information → ↓ accuracy
- Complexity of diagnostic task →
↑ complexity → ↓ accuracy

Factors within the nature of the diagnostic task that have been studied are relevance of data, amounts of data, and complexity of the diagnostic task. Relevance of data are recognized as high, moderate and low. Studies have shown that high amounts of low relevance data are associated with low accuracy. An example of this is when nurses collect a lot of assessment data without a concern for what is the diagnosis. The result is a lot of data that do not relate to making accurate diagnoses.

Gordon showed in 1980 that restricting information leads to higher accuracy; this study has not been replicated. The rationale was that, when forced to arrive at an answer with fewer data points, nurses move to diagnostic-specific associations of data with interpretations and are more likely to arrive at better diagnoses.

A few studies confirmed the logic that increased complexity was associated with lower accuracy.

There is sufficient evidence to show that we should be teaching and supporting nurses in efforts to rule in and rule out specific competing diagnoses instead of arbitrarily collecting data. Some of the newer studies in clinical decision making examined diagnostic reasoning but the concept of ruling in and ruling out diagnoses of human responses is still foreign to nurses.

Research Findings: Situational Context

- Time constraints
 - Time constraints- ↑ accuracy
- Role in healthcare system
 - Similar roles = Similar inferences
- Use of SNLs
 - Accuracy low without use of SNLs
 - Indications in pilot study (Lunney et al., 2004)

The fewest number of studies have been done to show the relation of situation contexts and accuracy. Gordon's 1980 study showed a positive relation of time constraints and higher accuracy, but these were time constraints within the diagnostic process, not time constraints that prevent the diagnosis process from occurring, as with high nurse-patient ratios.

Community health related studies in the 1980's showed that nurses in similar roles interpret data similarly and differently from nurses in other roles, e.g., staff nurses vs. clinical nurse specialists vs. managers. This is probably related to job responsibilities & expectations.

The contextual factor of using standardized languages and accuracy has indirect research support in that, for many studies showing variations in accuracy, standardized terms were NOT used. The effects of using NNN on children's outcomes was measured by Lunney et al.(2004) in a pilot study with 12 schools and 220 children in two groups, one group of nurses used NNN and the other did not. Study limitations prevented investigators from drawing conclusions but there were indications from the children and the nurses that use of NNN may be associated with better health outcomes. Studies are needed to test the effects of using NNN on quality of care.

Research Findings: Diagnostician

- Nursing education:
 - Mixed results
 - Level of education may not be as important as education related to NDx
 - Positive association with
 - Teaching aids
 - Continuing education on NDx
- Nursing experience:
 - Mixed results
 - Experience related to types of cases

Most of the studies related to accuracy have focused on nurses as diagnosticians. There is some evidence that improved accuracy is associated with higher levels of education. The evidence is stronger that higher accuracy is associated with education on nursing diagnoses and the diagnostic process, e.g., Muller Staub et al, 2007. Use of teaching aids such as decision trees and courses on nursing diagnosis were significantly related to higher levels of accuracy.

For nursing experience, too, it seems that it is not years of experience in nursing that is important but the experience of working with the same types of patients represented in the research studies. Studies of the decision making of critical care nurses further support this relationship, see Redden & Wotton (2001), and Reischman & Yarandi (2002). .

Clinical study showing that accuracy of data interpretations varies widely

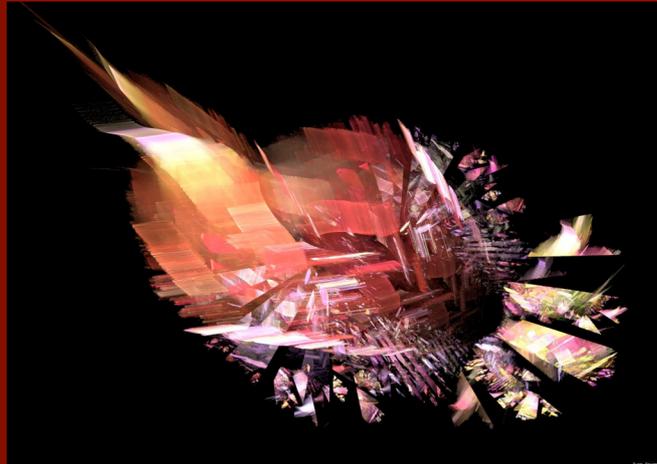
(Lunney et al., 1997)

SCORE	FREQUENCY	%	Cumulative %
+5	8	12.9	12.9
+4 & 4.5	20	32.3	45.2
+3 & 3.5	13	21.0	66.2
+2 & 2.5	13	21.0	87.2
+1 & 1.5	3	4.	92.0
0 & 0.5	4	6.5	96.5
-1	1	1.6	100.0
Total	62		100.0

This slide gives one example from a clinical study of accuracy. To my knowledge, this was the only clinical study of this topic.

The study (Lunney et al., 1997) took place in 3 hospitals in NY and NJ with 62 nurses who assessed 159 newly admitted patients for psychosocial responses. Each case was judged for accuracy by 2 masters prepared nurses who were trained to be accurate and to judge accuracy. Notice that the average score of 43.8% (21/62) nurses were not even close to the highly accurate diagnosis that was decided on by the 2 masters prepared nurses, working collaboratively with the patients.

The difficulty is that (1) human experiences are complex; (2) we do not know other people.



You might be asking yourself at this point: WHY?
Why do nurses have difficulty interpreting human responses to health problems and life processes.

The two main reasons are:

- 1) Human beings are unique and complex. Nurses are interested in the whole person, not just in an objective part of the person.
- 2) We do not know other people. Sometimes, we act as if we do know them, but essentially we do not know them. Thus, we have to listen carefully, use critical thinking, and conduct really good assessments in order to understand the needs of other people.

This is an example of the complexity of selecting the best nursing diagnosis to guide care.

S & of DYSREFLEXIA	S & S of DECREASED CARDIAC OUTPUT
Paroxysmal hypertension	Variation in blood pressure
Severe headache	Fatigue
Possible decreased urine output	Oliguria
Profuse Diaphoresis above injury; Chilling	Cold, clammy skin
Pallor below injury Facial erythema	Skin color changes
Chest pain	Chest pain (if angina or MI)
Bradycardia	Decreased pulses
Anxiety	Anxiety

The belief that diagnosing human responses is very complex was verified in 1984 by Glenn Webster, a philosopher of science. He knew all sciences and said that nursing is the most complex of sciences because it involves human beings and their health. This perspective is exquisitely clear in the case studies of my book on Critical thinking book, which was published in German thanks to Maria Mueller Staub. The complexity of data interpretations was also recently described through Human Factors Engineering Techniques in a series of studies by Potter et al.

These two diagnoses are one example of the similarities of two nursing diagnoses that require completely different interventions. Incorrectly diagnosing one of these diagnoses can generate harm to the patient.

Summary of Evidence: Research findings over 4 decades show that there is wide variation in the accuracy of nurses' data interpretations.



In the Lunney, 2008a article, I summarized the evidence. All evidence over 4 decades verifies that there is wide variation in the accuracy of nurses' data interpretations.

This is a picture of the standard model of Evidenced-Based Practice. Note in the black box on the bottom, it says we need to use the best available evidence. We have sufficient evidence now to expect that nurses accuracy will vary. And, when data interpretations vary, it means that some interpretations are not accurate enough to guide care.

Thus, the accuracy of nurses' data interpretations should be a serious concern.

- With formal use of nursing diagnosis



OR

- Without formal use of nursing diagnosis

-Does not communicate interpretations
-Communicates "problems"

Thus, the accuracy of nurses' diagnoses should be a serious concern of nurses worldwide, especially nurse leaders.

This concern is relevant whether or not the health care system is using the language of nurses diagnoses. Nurses interpret data, regardless of whether they use a language system or not. In systems that are not using nursing diagnoses, nurses either do not state their interpretations (they just act them and say what they did) or, nurses call their interpretations "problems," or whatever label is usually used in that system.

Nurses who do not use standardized nursing languages are probably less accurate.

- Extensional meaning

**Is
better to use than**

- Intensional meaning



I believe that nurses who do not use standardized nursing languages are probably less accurate than nurses who use nursing classifications such as NANDA-I.

This is because there are two kinds of meanings of concepts, extensional, or the meaning that is shared with other people based on classifications and other language-related tools, and intensional, the personal meaning that we attach to a concept. In nursing science, it is better to use the extensional meaning because it is important for the quality of care to communicate our words to others. It is better if the meanings of words are shared with others.

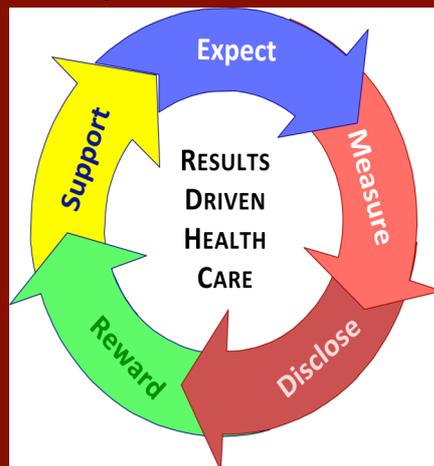
This picture shows how use of a nursing diagnosis classification helps nurses to achieve more accurate data interpretations (Lunney, 2008b).



This picture shows how use of a nursing diagnosis classification helps nurses to achieve more accurate data interpretations (Lunney, 2008b). Having the names available for human responses enables nurses to think about these phenomena and to discern what is happening with individuals and families using names from the classification, with definitions and descriptions. Because we have these names, it gives us the words to communicate and collaborate with other providers and patients themselves in deciding what is the best diagnosis.

Human beings can best work together when they have words with which to communicate about what they think. We also think with words, so if we do not have words for something, we cannot even see that thing, e.g., powerlessness.

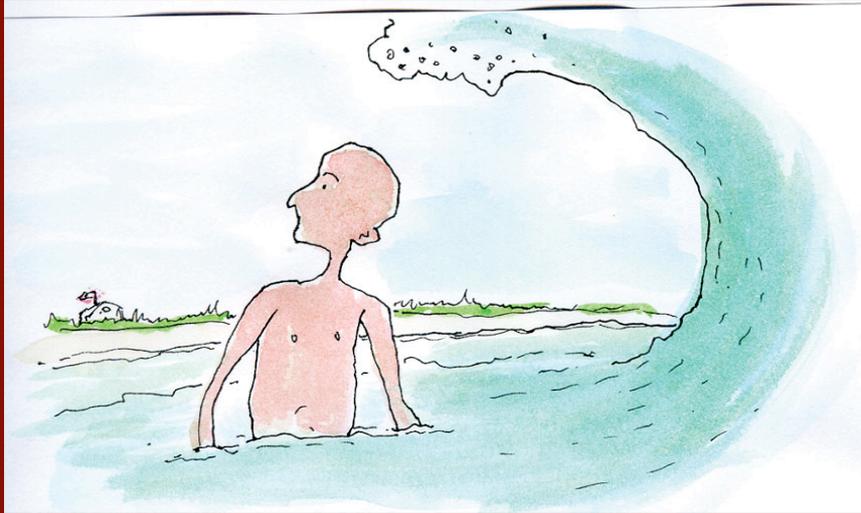
The degree of accuracy is probably not acceptable for quality care; needs to be studied.



Going back to the English-language research evidence, it suggests that the degree of accuracy is probably lower than it should be for high quality care.

Applying this model of results-driven health care, it says that we should expect the best care, i.e., high diagnostic accuracy, we should measure the factors that influence accuracy and the outcomes of accuracy, we should disclose the results of measurement, and we should reward and support those who contribute to high accuracy and better results.

Lack of attention to accuracy compounds the problem.

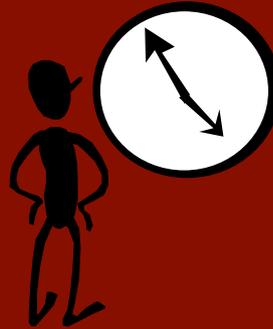


The current lack of attention to the issue of accuracy compounds the problem of low accuracy.

If we do not talk about it or even recognize it as a problem, we cannot achieve higher levels of accuracy.

Low accuracy contributes to

- Harm to patients & families
- Wasted time and energy
- Absence of positive outcomes
- Patient dissatisfaction
- Higher costs



This is a serious problem because low accuracy contributes to:

- Harm to patients
- Wasted time & energy treating diagnoses, e.g., knowledge deficit
- Absence of positive outcomes, and
- Patient and family dissatisfaction, and
- Higher costs (from wasted time and energy)

The status of this prediction from 1963 is that we are not there yet.

“I envision the day when nurses will spend time discussing ‘what is the diagnosis?’

Komorita, N.I. (1963). Nursing diagnosis.

American Journal of Nursing, 63 (12), 83-86.

In 1963, Komorita said

“I envision the day when nurses will spend time discussing ‘what is the diagnosis?’

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We are not there yet but we need to work on getting there.

The EHR is being implemented worldwide.

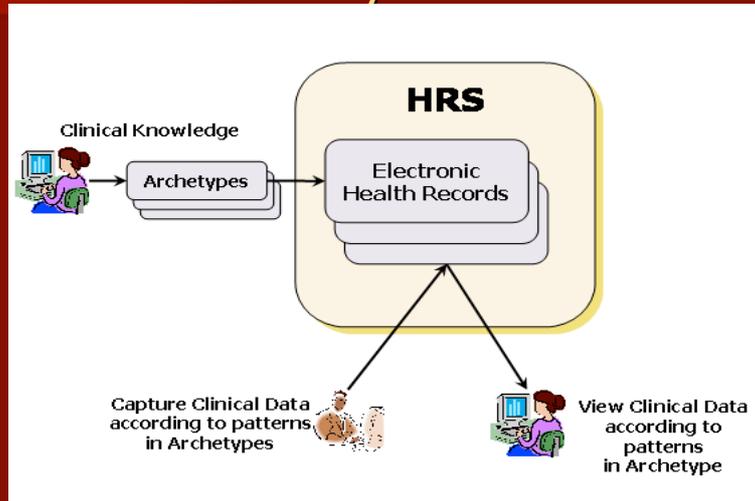


The EHR is being implemented worldwide. This means that the impact of low accuracy data interpretations will be more dramatic than it has been in the past with paper records.

All data will be used more efficiently and will be available for aggregation and comparison to know how well we are doing with health outcomes.

The data interpretations of nurses will be visible to everyone. Besides the nurse who made the diagnosis, everyone else will be expected to address this phenomena as well. The negative effects of low accuracy, e.g., wasted time and money, will be even greater with an EHR than it is now.

With the EHR, nurses' data interpretations will be visible and used by others.



With EHRs, clinical knowledge is recorded via archetypes such as nursing diagnoses. These archetypes capture clinical data and patterns, such as the number of patients who experience fear or anxiety and what the outcomes were of interventions for these phenomena.

We will be able to view clinical data according to these patterns. And, you can be sure that these patterns will be compared from one system to other systems, from one city to other cities, from one country to other countries, just as is done now for morbidity and mortality rates.

Data, diagnoses, interventions & outcomes will be transported locally, regionally, nationally and internationally.



We will be required to pass on certain kinds of data, e.g., the nursing care elements of the nursing minimum data set (nurses' diagnoses, interventions, outcomes and intensity), to our national statistical centers.

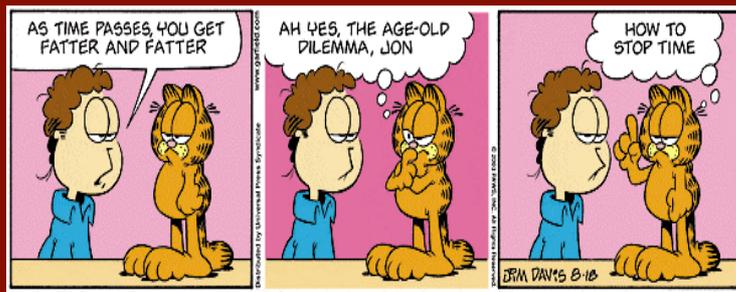
In the U.S., this will be the CDC in Atlanta, Georgia. The Swiss will probably send their data to Geneva. Is that right?

The impact of diagnostic accuracy will be exquisitely clear to everyone.



Thus, the impact of diagnostic accuracy will become exquisitely clear to everyone. The outcomes of nursing care that are influenced by diagnostic accuracy may be as good as others, better than others, or worse than others.

It is time now to attend to diagnostic accuracy.



To conclude this part of the paper, it is time now to attend to or address diagnostic accuracy. In this cartoon, the cat owner says, “As time passes you get fatter and fatter. And the cat says, “ah yes, the age old dilemma, how to stop time.”

Well, we cannot stop time, so it is time to address this issue so that it gets better, not worse.

Strategies can be developed at the system-wide level.

- Professionalism
- Autonomy
- Complex decision-making
- Collaborative practice
- Patient-nurse partnerships
- Time to think & reflect
- Evidence-based practice

Studies of system-wide policies and procedures need to be conducted to identify factors that impact on accuracy, e.g., the support that is necessary for nurses to be more professional, be make autonomous decisions, to be able to achieve complex decision-making, to work collaboratively with other nurses and with patients and families, to establish patient-nurse partnerships, and to achieve evidence-based practice. Some of these system-wide factors are currently being studied but not in relation to accuracy.

Studies of the effects of nurse-patient ratios and quality of care are relevant to accuracy as well as studies of nurses' abilities to implement evidence-based practice.

Promote nurses' image as diagnosticians.



From day 1 of nursing education programs, students need to start thinking of themselves as developing diagnosticians. This image can be reinforced and supported throughout education and practice experiences.

Based on the complexity of decision making in nursing, we need to help nurses develop tolerance for ambiguity. Students and nurses can be reminded that they are helping people with complex responses to health problems and life processes and that errors in diagnosing are consistently possible. They can be taught to recognize ambiguity and ways to deal with it, e.g., seek consultations, obtain research evidence, validate impressions.

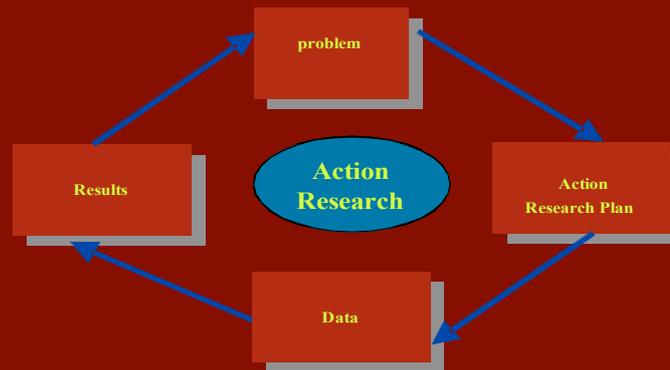
Nurse-patient partnerships are probably essential to obtain valid and reliable data from patients.

The need for critical thinking skills is self evident.

More is written about this in the articles on the bibliography.

EBN can be fostered by helping nurses to develop competencies for seeking and using research evidence.

Develop and test decision support tools, e.g., standards of care for specific populations.



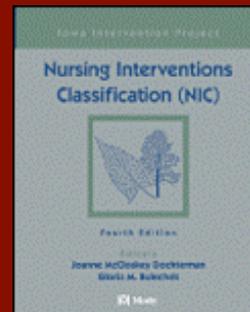
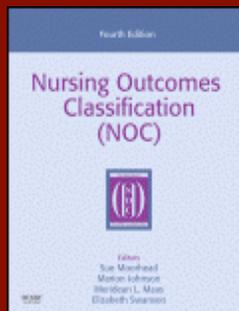
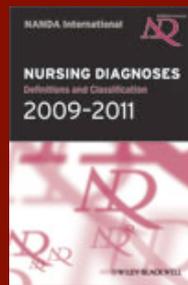
Recently, I have been using action research methods to identify the standards of care that apply to specific populations. This is a detailed method for experienced nurses to sit down together and decide what nursing diagnoses and associated outcomes and interventions generally apply to the people they serve. We have had very good results with this method. I am waiting for Judy Carlson, the founder of this research method to publish an article on how to do it. If you are interested in conducting this type of consensus validation study, write to me and I will help.

It is also possible to use decision support tools, such as algorithms, decision support trees, & practice protocols and guidelines. Some good references on this topic were cited in the Lunney 2008a article.

Provide resources that contain
EBN knowledge.

<http://www.nanda.org>

http://www.nursing.uiowa.edu/excellence/nursing_knowledge/clinical_effectiveness/index.htm



Sophisticated knowledge resources are essential to achieve high rates of accuracy. These include the latest books on diagnosis development, clinical experts that can function as consultants, and access to research evidence through the Internet, Cochrane reviews, and other sources.

The new NANDA-I Book is coming out in December of this year. The new NOC and NIC books were just published in 2008. The next editions are expected in 2012, so this is a good time to purchase them. If you use them in courses, you can ask the International Mosby representative for desk copies.

NOC is a research-based classification of patient outcomes that are sensitive to the quality of nursing care. NIC is a research-based classification of nursing interventions.

Study the effects of high and low accuracy on health outcomes.



In a recently published study, Welton & Halloran (2005) substantiated that use of nursing diagnoses explains a significant amount of variance in patient outcomes such as length of stay and disposition to nursing homes. Similar studies need to be done to show the relation of high vs. low accuracy of nurses' diagnoses and patient outcomes. EHRs need to be designed so that accuracy can be systematically and regularly examined. For example, the findings from assessment screens should be separate from diagnostic screens so data support for diagnoses can be retrospectively examined for the adequacy of data support.

One thing to consider is a request for patient and family signatures on the diagnoses that they validate and for which they agree to treatment, i.e., contracts between nurses and patients re: which diagnoses will be addressed.

Develop rewards for accuracy, e.g.,
acknowledgement, feedback.

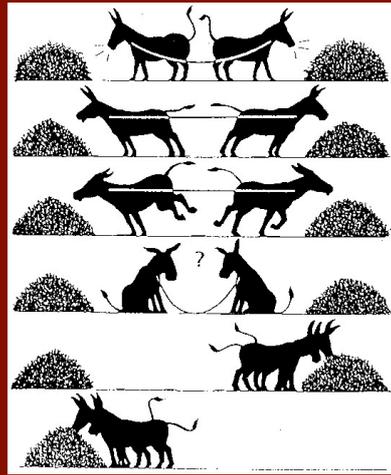


Remember the model for results-driven health care, it included rewards such as acknowledgement and feedback for high quality care.

Since nurses do not follow specific patients to other units and disposition to home or other health care agencies, it would be helpful to create feedback systems so nurses could know the outcomes of their diagnoses and be able to have evidence of individual patient outcomes.

If the public knew that nurses' diagnose human responses, it would promote accountability for accuracy. This could be done through agency newsletters, local newspapers, and by acknowledging diagnostic processes and outcomes with patients & families.

Encourage nurses to collaborate toward the achievement of diagnostic accuracy.



For accuracy, it is very important for nurses collaborate with each other and with patients and families. If we work together, we will be able to accurately identify the responses that should be treated.

Isn't this a cute cartoon showing the value of working together and sharing the task instead of trying to go it alone.

Work together toward the professional goal of diagnostic accuracy and treatment of human responses.



Nurse leaders in Switzerland, the U.S., and other countries can also work together toward the professional goal of diagnostic accuracy and the associated interventions and outcomes.

Excellence in nursing is achieved when we provide the best possible care for patients and families. The quality of care depends on diagnostic accuracy.



Excellence in nursing is achieved when we provide the best possible care for patients and families.

And the quality of care will depend on diagnostic accuracy.

Comments or Questions

