Nursing Expertise and Information Structure Influence Medical Decision Making

Laura A. Brannon and Kimi L. Carson

This study examined the influence of nursing expertise and information structure on certainty of diagnostic decision making. Two hundred and sixteen nurse (experts), student nurse (novices), and non-nurse (naive) participants read patient scenarios either high in information structure (consistent diagnostic information) or low in information structure (inconsistent diagnostic information) and rated their certainty about what the potential diagnosis might be. Results indicated that participants with pre-existing cognitive schemata for processing patient information (experts and novices) were more certain about decision making with structured information than they were about unstructured information, but structure of information did not influence certainty ratings of naive participants.

How individuals judge their own ability to make decisions is influenced by how they go about gathering and interpreting information (Einhorn, 1980). Their confidence about decisions that they make is influenced by the ambiguity of the information to be judged. Additionally, individuals' levels of expertise may influence the quality of their decision making.

Examining such decision-making processes in nursing may serve to assist with gaining an understanding of how education may aid effective decision making in the face of ambiguity. Nurses and other medical personnel are often asked to make quick decisions in the face of diagnostic ambiguity or incomplete diagnostic information. Both the cognitive task demand (such as diagnostic ambiguity and time pressure) and experience/education may influence the type of decision that is made in a nursing setting (Narayan & Corcoran-Perry, 1997). Additionally, it has been observed that experienced nurses use more complex cognitive processing when evaluating patients than students do (Westfall, Tanner, Putzier, & Padrick, 1986). Yet, systematic investigation of the nurses' personal awareness of their accuracy has not yet been conducted. Because a nurse's awareness of how accurate she or he is being when evaluating patients may directly influence patient care (e.g., being aware of low certainty may cue a nurse to seek colleague consultation), it is important to study.

The extent to which nurses are able to efficiently process symptom information is one factor that may influence how they judge their own decision-making processes. Information is processed efficiently when an individual can use heuristics, stereotypes, or scripts/schemata (Neuberg & Newsom, 1993). In such instances (e.g., when the information is presented in a structured way, or when individuals can efficiently process and interpret the information because they are experts), there is a super-ordinate organization principle that categorizes the information and that simplifies the processing of this information. The alternative information-processing method is piece-meal processing, in which each piece of information is evaluated separately. Such a process must be used either when the individual does not have appropriate heuristics or schemata to apply (someone lacking experience or expertise) or when the information is ambiguous or unstructured, as when nurses examine a patient whose symptoms reflect multiple diagnostic possibilities.

Research indicates that the facilitation of efficient information processing both through the ma-

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nipulation of the nature of the information about the patient (information structure) and through the availability of schemata via education or experience (expertise) can influence decision making (Tabak, Bar-Tal, & Mansfield, 1996). Previous research examined only expert nurses and student nurses but did not include a completely naive (non-nurse) sample as a comparison group of individuals who completely lack any schemata based on education. The current pilot study represents an extension of the previous work by examining certainty in decision-making in expert nurses, novice nurses, and naive non-nurses. Participants read patient information that was either structured or unstructured and rated their diagnostic certainty. It was expected that pre-existing cognitive schemata would aid experts in their processing of unstructured information such that experts would report greater certainty about unstructured information than less experienced participants, and those with less experience would report greater certainty with structured information.

METHOD

Two-hundred sixteen nurses (experts), student nurses (novices), and non-nurses (naive) participated in this pilot study. Participants read two scenarios, one with a high degree of diagnostic consistency (high in information structure) and one with a low degree of diagnostic certainty (low in information structure). These scenarios were adapted from Tabak et al. (1996). The structured scenario suggested only one diagnostic possibility (stroke) and read as follows: "You work on the night shift on an internal medicine unit, and you are called to the bathroom where the patient, M. N., fell on the floor. You notice the following symptoms: paralysis of half the face, weakness in the same side of the body (hand and leg), slow and unclear speech, confusion, dizziness, blood pressure 220/160."

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The unstructured scenario presents a mixed symptom presentation that could suggest multiple diagnostic possibilities. It read as follows: "A 60-year old Caucasian male is admitted with the following symptoms: pain radiating to left arm, skin eruption, accelerated pulse rate, pressure on chest, pain while passing urine, strong leg pain, shortness of breath, sore throat, low level of PO_2 (oxygen pressure in the blood)."

Following each scenario, each participant was asked to generate a diagnosis and rate their level of confidence in their own diagnosis (from 0%-100%). Confidence ratings were then converted to certainty estimates using a procedure developed in previous research (Tabak, Bar-Tal, & Cohen-Mansfield, 1996). Because participants were asked to rate their confidence in the correctness of their diagnosis (from 0%-100%), ratings of both 0% and 100% reflect perfect certainty while a rating of 50% reflects highest uncertainty. For example, ratings of 0% reflect perfect certainty that the diagnosis was incorrect while ratings of 100% reflect perfect certainty that the diagnosis was correct. It is as vital for nurses to be aware that they do not have an accurate diagnosis (and therefore must consult someone else) as it is that they do have an accurate diagnosis. To transform confidence ratings into certainty ratings, the absolute differences between 50 and the confidence ratings were computed.

RESULTS

A 3 (between: expert, novice, naive) $\times$ 2 (within: structured information, unstructured information) mixed analysis of variance was performed on the certainty ratings. As expected, there was a significant main effect of information structure ($F[1,209] = 25.66$, $p < 0.001$], such that participants expressed more certainty in response to structured ($M = 33.80$) than to unstructured information ($M = 26.77$). There was also a significant interaction between information structure and expertise level (F [2, 209] $= 17.87$, $p < .001$). Certainty ratings for structured versus unstructured information were compared within expertise levels. Experts and novices reported more certainty (pairwise comparisons, $p < 0.05$, Bonferroni adjustment) with structured information ($M = 39.72$ and 35.68, respectively) than with unstructured information ($M = 22.54$ and 26.43, respectively). Naive participants reported equal certainty with

structured and unstructured information (M = 26.00 and 31.33, respectively).

Certainty ratings were also examined by comparing expertise levels within structured and unstructured information separately. Both experts and novices were more certain with structured information than were naive participants. Only experts were significantly less certain than naive participants about unstructured information (pairwise comparisons, $p < 0.05$, Bonferroni adjustment).

DISCUSSION

Expertise and information structure influence diagnostic certainty. Contrary to expectations, the present study did not find that pre-existing internal cognitive schemata for processing diagnostic information (the experts and novices) increased certainty for diagnosing patients who present with a symptom presentation that is low in information structure. Instead, this study found that experts and novices reported greater certainty with information that is high in structure compared with information low in structure. In hindsight, this outcome made sense. Experts having well-defined cognitive schemata for various diagnoses should have readily recognized when a structured pattern of symptoms was consistent with their preexisting schema. This increased the certainty of their diagnoses. On the other hand, naive participants rated certainty concerning both unstructured and structured information as being comparable. They did not have well enough developed schemata to recognize the ambiguity in the unstructured information (note that being overly certain in the accuracy of a diagnosis that reflected ambiguous symptoms was not, in fact, desirable). Although increased expertise influenced the certainty individuals had with diagnostically clear information, it did not appear to assist experts with processing information that was more mixed to a degree that would have increased their certainty in their decision making. Given that the symptoms presented did not clearly represent a single diagnosis, this uncertainty was appropriate. The more complex the case, the more alternative diagnoses had to be considered, and therefore, the less certainty that any given diagnosis was correct (Corcoran, 1986).

This was consistent with the current finding that only experts were less certain than naive participants with respect to unstructured information. Experts may have been more adequately able to judge the unstructured information as being ambiguous than were novices, and they may have appropriately used a piece-meal processing strategy with information that was diagnostically ambiguous. Novices, on the other hand, may have inappropriately applied their cognitive schemata and attempted to use heuristic-based procedures with unstructured information such that they had a greater degree of certainty than someone who recognized when it was appropriate to apply a piece-meal decision-making process. Rigidly relying on cognitive schemata was actually less appropriate when the information encountered was unstructured such that it was not entirely consistent with the schema (Tabak, Bar-Tal, & Cohen-Mansfield, 1996). It was as though novices decided that the fit with the schema was "close enough," whereas the experts took the inconsistencies more seriously.

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Additional research is needed to determine if, indeed, experts, novices, and naive participants do change their strategy for processing information that is high or low in structure. Although the present results suggest that experts are more likely to be able to recognize that unstructured information cannot be processed with a heuristic process, these results support this hypothesis in an indirect fashion, using certainty ratings. Research that more specifically examines this hypothesis by examining the step-by-step generation of diagnostic possibilities with structured and unstructured information would do much to advance knowledge of the role of expertise and information structure on diagnostic certainty.

One implication of the current results is that nursing education should emphasize differential diagnosis procedures. Novices can be taught to imitate the decision-making strategies of experts

through the use of think aloud protocols and reasoning through analogy (Tabak, Bar-Tal, & Cohen-Mansfield, 1996). Not only should students practice diagnosing cases of various levels of complexity, but they should also be taught the importance of looking for information that might disconfirm their initial diagnosis and of not being overly confident in their decisions. Fortunately, research has shown that it is possible to reduce overconfidence by educating individuals about this tendency and by providing individuals with appropriate feedback about when they appear to be overconfident given the symptom presentation (Baumann, Deber, & Thompson, 1991).

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