

## Factors That Influence the Clinical Decision Making of Novice and Experienced Physical Therapists

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**Background.** The depth and breadth of prior experience informs clinical decision making in novice and experienced physical therapist clinicians.

**Objectives.** The aims of this research were to identify differences in clinical decision-making abilities and processes between novice and experienced physical therapist clinicians and to develop a model of the factors that influence clinical decision making.

**Design.** Qualitative research methods and grounded theory were used to gain insight into the factors and experiences that inform clinical decision making.

**Methods.** Three participant pairs (each pair consisted of 1 novice physical therapist and 1 experienced physical therapist) were purposively selected from 3 inpatient rehabilitation settings. Case summaries from each participant provided the basis for within- and across-case analyses. The credibility of the results was established through checking of the case summaries by the participants, presentation of low-inference data, and triangulation across multiple data sources and within and across participant groups.

**Results.** The factors that influenced clinical decision making were categorized as informative or directive. Novice participants relied more on informative factors, whereas experienced participants were more likely to rely on directive factors. An intermediate effect beyond novice practice was observed.

**Conclusions.** The results of this study may be used by educators and employers to develop and structure learning experiences and mentoring opportunities for students and novice learners with the aim of facilitating the development of skills and abilities consistent with expert clinical decision making.

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[Wainwright SF, Shepard KF, Harman LB, Stephens J. Factors that influence the clinical decision making of novice and experienced physical therapists. *Phys Ther.* 2011;91:87–101.]

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Informed clinical decision making (CDM) is the cornerstone of the effective care of patients. Whether novice, experienced, or expert clinicians, physical therapists strive to meet the standards established in the *Guide to Physical Therapist Practice* for the effective care of patients.<sup>1</sup> How clinicians develop the attributes of expert practice has been studied across the medical<sup>2-6</sup> and health<sup>7-18</sup> professions. Although it is recognized that prior experience informs CDM processes,<sup>2,3,19</sup> the length of time and type of experience necessary for developing and refining CDM abilities are unknown. Evidence that the development of these thought processes is dependent on both sufficient time and varied experiences is beginning to emerge.<sup>5,12</sup>

### CDM Theories

The definitions of CDM recognize that it is a process including skills such as critical thinking and problem solving, which are essential to making appropriate decisions and taking action for the effective care of patients.<sup>7,20,21</sup> Higgs and Jones further stated that decision making “is central to the practice of professional autonomy.”<sup>21(p3)</sup>

The model of medical reasoning processes describes the progress of CDM for physicians: from cue acquisition through hypothesis generation, cue interpretation, and hypothesis evaluation to the endpoint—the implementation of appropriate interventions.<sup>22</sup> Clinical decision-making abilities are proposed to develop in

stages through the experience of academic and clinical education. The progression from novice CDM to expert CDM is characterized by the transition from the hypothetico-deductive reasoning processes used by novice clinicians<sup>2</sup> to the forward reasoning processes and purposeful management of information evidenced by expert clinicians.<sup>5,22,23</sup> This transition is characterized by a shift from using biomedical knowledge to using clinical knowledge during the progression from preclinical education to clinical education.<sup>4</sup> For example, novice clinicians are prone to making errors in CDM, have limited knowledge, and are less able to recall what they have learned than expert clinicians.<sup>3</sup> The forward reasoning processes used by experienced physicians are characterized by a broad and structured knowledge base, the use of “if/then” production rules, the use of pattern recognition, and the development of a working diagnosis from the data.<sup>4,22</sup>

### Characteristics of CDM in Physical Therapy

Study of master physical therapy clinicians reveals that they are better able to use more of the treatment time engaged in direct treatment of patients, handle environmental interruptions without disrupting treatment, use social interaction as a means of eliciting information from and providing information to patients, and provide more frequent and integrated cues and encouragement than novice clinicians.<sup>8,9</sup> Physical therapist experts working with pediatric patients demonstrate the ability to apply knowledge to clinical practice, are responsive to patient and environmental cues, and use improvisation during ongoing self-monitoring throughout the CDM process.<sup>10</sup> A revalidation survey of novice and certified neurologic specialists revealed similarities in skill performance but differences in reasoning processes.<sup>13</sup> The skill of self-

assessment (including self-starting, self-directed, self-paced learning and practice) is recognized as essential to continued clinical competence.<sup>10,24</sup> This information has provided the foundation for the subsequent study of CDM in various experience and practice settings, such as cardiopulmonary,<sup>25</sup> pediatric,<sup>26</sup> and hand therapy<sup>27</sup> settings.

### Development of CDM Abilities

Clinical decision making integrates the affective, cognitive, and psychomotor domains of learning. The development of CDM skills depends on a variety of factors, including the affective attributes of self-assessment and reflection<sup>10,28</sup> as well as experience.<sup>2,3,6,8,9,19</sup> Attainment of knowledge and skills in these 3 domains of CDM is necessary for effective clinical practice. The stage theory of clinical reasoning describes how physicians who have evolved from novice practice to expert practice incorporate 3 tenets<sup>2</sup>:

1. Medical students progress through developmental transitions, each characterized by a uniquely organized body of knowledge.
2. Novice to intermediate physicians develop cognitive representations of knowledge that may be applied to future clinical dilemmas.
3. Experienced physicians use “illness scripts” when diagnosing routine cases.

This progression accounts for the consistency of domain-specific knowledge among clinicians within a stage and recognizes that different mental processes are seen in novice clinicians and expert clinicians.<sup>3</sup>

Physical therapist experts demonstrate “dialectical reasoning,” which is characterized by the use and integration of a variety of knowledge

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*This article was published ahead of print on December 2, 2010, at [ptjournal.apta.org](http://ptjournal.apta.org).*

**Table 1.**Characteristics of Novice and Experienced Participants<sup>a</sup>

Participants (Years of Experience as Physical Therapist)	Pseudonym	Age (y)	Sex	Other Physical Therapy-Related Employment	Entry-Level Degree	Post-Entry-Level Degree
Novice (<1)	Galway	26–30	M	No	DPT	No
	Cavan	26–30	F	Yes	DPT	No
	Kerry	26–30	F	No	DPT	No
Experienced <sup>11</sup> (>8)	Mayo	31–35	M	No	MPT	No
	Dara	31–35	F	Yes	MPT	No
	Cork	36–40	M	Yes	MPT	t-DPT

<sup>a</sup> M=male, DPT=doctor of physical therapy, F=female, MPT=master of physical therapy, t-DPT=transitional doctor of physical therapy.

paradigms, when making clinical decisions.<sup>14</sup> This description of dialectical reasoning is consistent with the “illness scripts” and “biomedical knowledge” propositions identified in the medical literature.<sup>2,3</sup> In addition, the development of expertise is likely driven by noncognitive factors, such as the nature of the knowledge domain, an individual’s prior experience, and the acquisition of established group norms,<sup>3</sup> which is a component of professional development in novice practitioners.

Although the literature has identified differences in CDM abilities in practitioners with different levels of experience across the professions, how abilities develop has not been studied in depth. The goal of this study was to expand the multidisciplinary knowledge base of CDM by focusing on how experience affects the development of CDM processes and abilities of novice and experienced physical therapists and fosters the behavioral attributes consistent with expert clinical practice.

## Method

Grounded theory<sup>29–31</sup> and data collection from the participant’s perspective<sup>32</sup> within the phenomenologic philosophy<sup>29,32–34</sup> were blended to meet the research aims. The primary researcher (S.F.W., hereafter referred to as “the researcher”) gained insight into the sources of

information used by the participants (therapists) in the CDM process through observation of evaluation and treatment sessions and semistructured interviews. The semistructured interviews were also used to identify the type of prior experience and the contribution of that experience to the development of CDM processes and abilities. The research design and methods used in this study were previously reported.<sup>19</sup>

## Participants

Purposive sampling techniques<sup>34,35</sup> were used to elicit participation from 3 pairs of clinicians, consisting of 1 novice physical therapist (<1 year of experience) and 1 experienced physical therapist (>8 years of experience),<sup>11</sup> at 3 inpatient acute care rehabilitation centers (Tab. 1). Each participant was currently treating patients with cerebrovascular accidents and had primary clinical experience in neurologic physical therapy in an inpatient rehabilitation setting. Fifteen clinical sites across 3 states were contacted to yield the 3 participant pairs meeting all of these inclusion criteria.

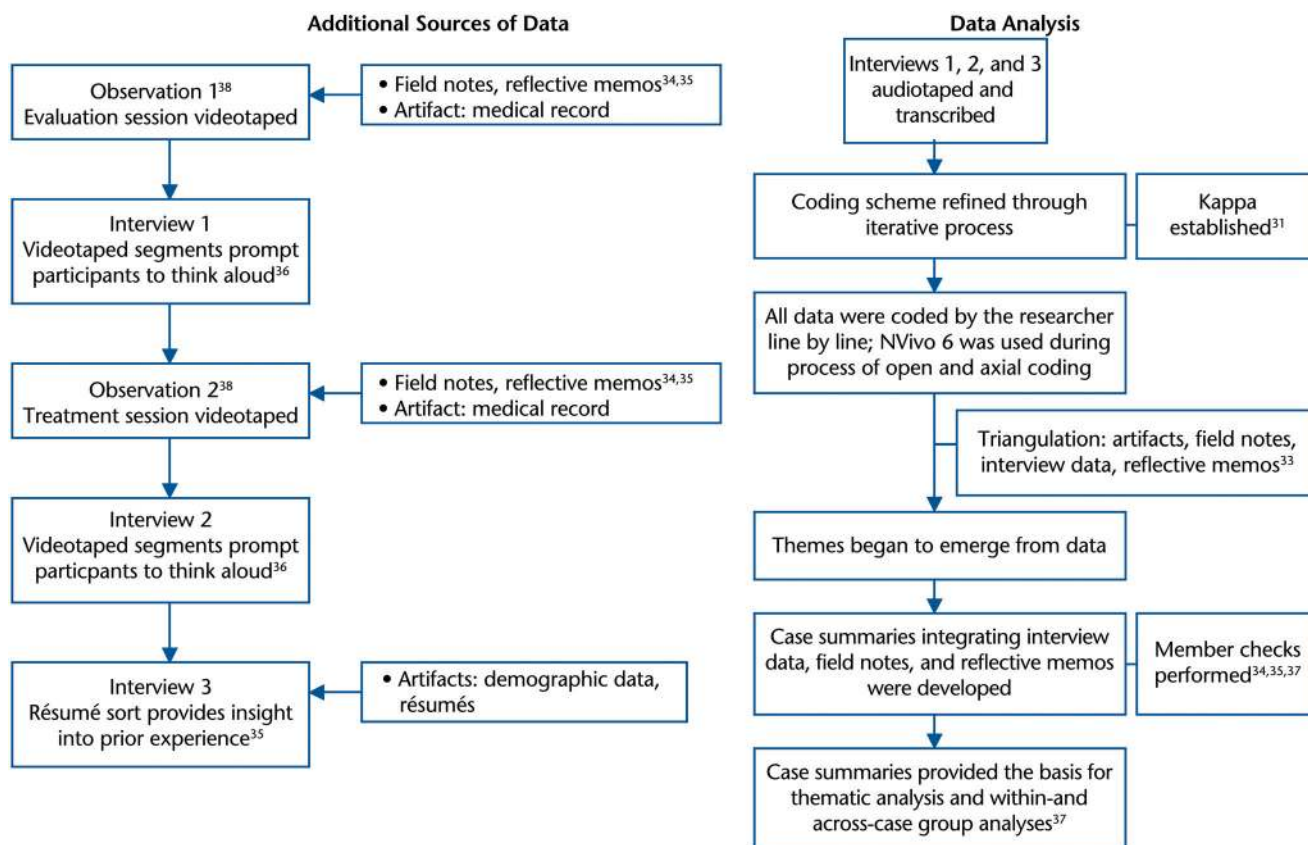
Earlier work establishing the attributes of expert practice in physical therapy<sup>8–13</sup> provided a comparative reference for the novice and experienced participants in the present study. Because the topic of the present study was the develop-

ment of CDM, the experienced physical therapists provided insight into typical physical therapist practice. Establishing typical (rather than expert) practice was essential in gaining comparative insight into the experiences, abilities, and behaviors of the novice participants.

Inpatient acute care neurologic rehabilitation settings were selected for 2 reasons. First, less work on the development of expertise in this setting has been done.<sup>11</sup> Second, the researcher had primary clinical experience involving patients with cerebrovascular accidents in this clinical setting. Having knowledge in common with the participants facilitated insight into their CDM processes. Selecting 1 participant pair from each clinical site served to minimize the effects of varied prior experiences, and recruiting from 3 clinical sites provided the opportunity for observation across several clinical environments. Each clinical site afforded the participant pairs unique clinical experiences, supervision structures, and mentorship opportunities.

## Data Collection and Management

Informed consent and permission to videotape were obtained from each therapist and patient, and additional permission to audiotape was obtained from the therapists. The sources of data and the sequence



**Figure 1.** Process of data collection and data analysis. Member checks=checking of case summaries by participants.

of the data collection process are shown in Figure 1. Two separate sessions (1 evaluation and 1 treatment) between each therapist and patient with a cerebrovascular accident were videotaped. Prior to the interviews, the researcher used field notes to select portions of the videotapes to view with each participant in separate audiotaped semistructured interviews (interviews 1 and 2) (Appendix 1).<sup>36</sup> Videotaped segments included activities with which each participant began the session and transitions that occurred throughout the session. For example, each videotape review of an evaluation began with the patient interview to prompt a discussion of each participant's approach to evaluation. Subsequent preselected videotape segments were representative of impairments and functional limitations

examined. Occasionally, comments made by a participant during the interview directed review of videotape segments not selected for review by the researcher, affirming that decision making from the participant's perspective was recognized. A résumé sort was completed in another audiotaped semistructured interview (interview 3) (Appendix 2). All 3 audiotaped interviews were transcribed verbatim. Interview data were triangulated with artifact data (medical records and participant résumés) and the researcher's field notes and reflective memos.

**Data Analysis**

Throughout the data collection process, the researcher attended to the data, identifying preliminary codes and themes. During each observation and interview, the researcher

made field notes identifying commonalities in observed activities or statements made by the participants. Reflective memos made by the researcher further identified or clarified impressions, thoughts, and relationships in the data or about the participants. In addition, during transcription and review of semistructured interviews, commonalities were revised and refined into an exhaustive coding scheme of mutually exclusive codes that represented the data.

Through an iterative process of coding of a subset of the data and discussion between the researcher and a peer expert, a coding scheme representative of the participants' views was developed (Fig. 1). All subsequent data were read and coded line by line. Qualitative data management

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software (NVivo 6\*) was used during the process of open and axial coding. Through this iterative process of coding, themes representative of the types of reflection<sup>19</sup> and the experiences and activities that participants applied to their CDM processes emerged from the commonalities in the data. Emergent themes that characterized the CDM processes and abilities of the participants included sources of information, reflection, prior professional experience, and prior personal experience. A case summary that integrated portions of the 3 interviews with demographic and artifact data, field notes, and reflective memos was developed for each participant. The case summaries provided the basis for thematic analysis and within- and across-case analyses for the participant groups (novice participants and experienced participants).<sup>37</sup>

### Establishing Scientific Rigor

As reported in a previous study, the reliability of the coding scheme was confirmed by a percent agreement between 2 researchers of 86.4%, with a kappa value of .85, representing excellent agreement.<sup>31</sup> The trustworthiness of the data was ensured through checking of the case summaries by the participants and presentation of low-inference data.<sup>29,34</sup> Participants reviewed their case summaries, and all affirmed that the researcher accurately represented their thoughts and words. The credibility of the data was ensured through ongoing peer assessment during all phases of the research study by an experienced qualitative researcher. Strategies to reduce researcher bias included reflexive bracketing and maintenance of a log that included memos, field notes, and a reflective journal.<sup>38,39</sup>

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## Results

Four themes emerged from the data (Tab. 2). One theme, prior personal experience, was important to only 1 participant and, therefore, is not discussed in this article. The remaining themes are prior professional experience, sources of information, and reflection. The role of reflection in the CDM processes of the participants was reported previously.<sup>19</sup> Therefore, the role of reflection is presented in the conceptual frameworks, but the data are not presented in this article.

### Prior Professional Experience

Two types of prior professional experience were identified by the participants: academic and clinical.

**Academic experience.** All of the participants indicated that their critical thinking skills developed well before their physical therapist education. Five of the 6 participants received bachelor of science degrees in the biological sciences (artifacts in curriculum vitae for Galway, Cavan, Kerry, Mayo, and Dara). Kerry, a novice participant, provided comments that exemplified the perception that an undergraduate concentration in the sciences facilitated the development of CDM abilities<sup>†</sup>:

I think it's nice to have scientific background . . . scientific theory and hypothesizing. We can . . . test things and see if they work. . . . You don't want to be doing pseudo-science. You want to make sure that what you're doing has its benefits and that it's good for the patient. (Novice participant—Kerry 3:56–64)

In contrast, Cork, an experienced participant who did not pursue an undergraduate degree in the biological sciences, identified the breadth of his preprofessional education as

a strength in developing his CDM skills:

My major was creative writing. . . . I dabbled in just about everything while I was at \_\_\_\_ University. And my minor was physical anthropology. I studied music for the first time in my life. . . . It just broadened me so much. And I was so glad I wasn't a science major . . . (Experienced participant—Cork 3:82–87)

**Clinical experience.** This factor was cited most frequently by all of the participants. Each participant provided examples of experiential learning activities that afforded opportunities to apply skills and knowledge to practice. Experiences perceived as most valuable were those that provided feedback from experienced clinicians within the context of “patient/client management” (as outlined in the *Guide to Physical Therapist Practice*<sup>1</sup>), without the distraction of “practice management” responsibilities. Factors of particular relevance in clinical experience included mentorship, continuing education, and clinical teaching.

Two specific forms of mentorship were identified: mentorship of behaviors and mentorship of clinical skills.

In mentorship of behaviors, participants valued and attempted to internalize into their own clinical practice behaviors modeled by clinicians. All 3 experienced participants identified mentors who facilitated the development of attributes such as confidence, effective communication, and a commitment to learning. Dara, an experienced participant, identified a perspective that she gained from a clinical instructor and that she now shares with people she mentors:

And she [clinical instructor] always said to me, “It doesn't matter what you're doing as long as you look and

<sup>†</sup> Format for identification of participants' quotes is: level of expertise, pseudonym, interview number, and transcript lines.

## Clinical Decision Making of Novice and Experienced Physical Therapists

**Table 2.**  
Emergent Themes and Corresponding Factors<sup>a</sup>

Theme	Factor	Definition
Prior professional experience	Academic experience: content and faculty mentorship	Experiences that contributed in a positive or negative way toward the development of physical therapy knowledge and skills
	Academic experience: critical thinking	Experiences that contributed in a positive or negative way toward the development of general critical thinking abilities
	Clinical experience	Experience gained through exposure to a variety of patients and practice settings, including clinical education experiences
	Clinical mentorship: behaviors	Exposure to professional behaviors that could be incorporated into developing clinical decision making
	Clinical mentorship: skills	Exposure to clinical skills that could be incorporated into developing clinical decision making
	Clinical teaching of others	Formal or informal instruction provided by clinicians in clinical settings for staff, students, and other therapists
	Continuing education	Formal instruction in skills or knowledge providing a basis for clinical decision making or patient interactions
Sources of information	Medical record	Information gained from a medical record or other documentation
	Anticipated patient performance	Information gained from previous observation of the current patient or other patients
	Literature	Case studies, clinical research studies, and suggestions from the field
	Observation of patient's movement behavior and problem solving	Observed clinical performance within the context of performing functional activities
	Observation of patient's psychoemotional and cognitive perceptual abilities	Degree and nature of apparent impairments observed during patient interactions
	Protocols	Established clinical pathways
Reflection	Reflection-in-action	Analyzing the effectiveness of one's own cues, handling, and patient performance and behaviors; decisions are made and interventions may be modified during therapist-patient interactions
	Reflection-on-specific action	Thinking about the clinician-patient interaction and patient performance after the treatment session; plan of care is affirmed or modified on the basis of the assessment
	Reflection-on-professional experience	Thinking about prior experience; ways of thinking about clinical decision making and professional practice beyond one-on-one practice are formulated
Personal experience	Exposure of self, family member, or friend to physical therapy	Contribution of exposure to physical therapy through one's own, family member's, or friend's experience to the development of a framework for clinical decision making

<sup>a</sup> The role of reflection was reported previously.<sup>19</sup> Personal experience was important to only 1 participant and, therefore, is not discussed in this article.

act as if you know exactly what you're doing at all times. And if you do that, the patients will feel confident with you. No matter what. Whether you're a student or you have plenty of experience." That's just stuck with me. I've given the same advice to lots of people. (Experienced participant—Dara 1:34–38)

In comparison, only 1 novice participant, Galway, provided an example specific to this factor:

He [clinical instructor] at one point asked me what my thought process was, what model I was going by. . . . And I hadn't been thinking so much about it. And [he said], "I want you

for the rest of the affil to think about it—are you going down this route or this route?" And it made me think a little bit more about the academic side. I had never made the connection up to that point. (Novice participant—Galway 3:230–235)

Mentorship of clinical skills included training in the “tools of the trade” by experienced therapists. Novice participants provided insight about this type of mentoring relationship more frequently than experienced participants. Positive mentoring experiences provided ideas and skills that enhanced clinical practice:

When I first started working I would ask, “Do you have ideas that I can do with so and so?” And then they would give me ideas. If they have an open space they’ll treat with me and give me ideas. We work together and look at the patient. (Novice participant—Cavan 1:100-103)

Cavan has used mentors to foster the development of clinical skills:

I’ve modeled myself . . . I see Meath (Clinical Specialist) do it, and then I do it. I’m doing it because that’s the progression that I’ve seen other people do. I see them try standing and then try walking, at the bars and on the wall. I understand their rationale. . . . (Novice participant—Cavan 3:306-310)

As the experienced participants’ CDM abilities evolved, this form of mentoring became more collaborative, as exemplified by Mayo’s comments:

I’ve asked people, “What would you do?” I think that’s important—to ask people to get different views. Even first-year clinicians have views. . . . (Experienced participant—Mayo 2: 516-517)

With regard to clinical teaching, all 3 experienced participants had adjunct appointments at local universities and were resource clinicians at their respective clinical sites. Dara and Cork supervised staff members. Cork taught continuing education courses. Clinical teaching was one way in which the experienced clinicians remained current with the literature and contemporary clinical practice, as described by Dara:

**Table 3.** Similarities and Differences Between Novice and Experienced Physical Therapist Clinicians in the Definition of Clinical Decision Making

Novice Participants	Both Groups of Participants	Experienced Participants
Planning within the context of the patient’s discharge	Previous clinical experience	Using the therapist-patient interaction to direct the clinical decision-making process
Flexible approach relative to patient presentation		Incorporating information from a variety of sources
<i>Guide to Physical Therapist Practice</i> <sup>1</sup>		

Then when you teach other people, . . . use information that you’ve learned and convey it to someone else. So in doing that I learned it again. (Experienced participant—Dara 3:134-136)

And we do that all the time, though it’s not formal. . . . And it still keeps everything very fresh, because we’re always teaching other people the information. (Experienced participant—Dara 3:139-142)

Galway was again unique, as he was the only novice participant who related experience with clinical teaching:

I had an opportunity when I was at \_\_\_\_\_ Hospital on my last affiliation. There were PT [physical therapist] students that would come down. My CI [clinical instructor] said, “Would you mind having one of them come around with us?” I thought, “It’s not going to change how I treat, so let’s go.” I knew that no matter what, I knew more than they knew. . . . I think one of the things that \_\_\_\_\_ University taught [me] was that you’re always learning, and at the same time you should always be teaching. That’s what we do. We’re always teaching patients. It’s not a huge jump to teach a colleague. (Novice participant—Galway 1:382-387)

With regard to continuing education, in their brief time in clinical practice, 2 of the 3 novice participants have attended continuing education courses focused on the acquisition of clinical skills consistent

with the philosophical perspective of their clinical mentors. Among the experienced participants, there were dichotomous views of the value of continuing education. Mayo did not recognize continuing education as a major factor contributing to his CDM or his approach to the care of patients, whereas the other 2 experienced participants developed their philosophical orientation about the care of patients around theoretical foundations learned in course work. Dara, an experienced participant, exemplified this finding in the following excerpt:

I did the 3-week NDT [neurodevelopmental treatment] course. I did several advanced NDTs. And I just think that that really shaped how I see the whole patient and how I really treat now. I think those NDT courses were the most influential in what I do day to day with patients. (Experienced participant—Dara 3:130-133)

The factors that the participants used to define CDM are shown in Table 3. Following is an example of how novice participants defined CDM:

. . . using your past experience and knowledge to make decisions about how you’re going to approach treating a patient. Taking into account where they’re going, where they came from, and the kind of support they’re going to have at home. And making a decision about what you’re going to treat, trying to use things that you’ve experienced having success in

the past or using what's out there in the evidence to lead the way. (Novice participant—Kerry 3:7-13)

Within the definitions used by novice participants, the *Guide to Physical Therapist Practice*<sup>1</sup> was incorporated by Kerry, who identified using the “evidence to lead the way” when making decisions (see earlier statement); by Cavan, who described “seeing the whole patient” (Cavan 3:7); and by Galway, who used “Guide” terminology and described the patient/client management model (field note 3/22/05). The novelty of the patient-therapist interaction was characterized by Galway's comment (Galway 3:15) that “9 out of 10 times the plan is not going to work” or by Cavan's comment (Cavan 3:8) that the plan of care would be unique for each patient: “. . . making decisions based on your experience with that person.”

The definitions used by experienced participants were remarkable for the extent of integration of these concepts. The following excerpt is an example of the comments made by the experienced clinicians:

I'd use the information from the patient's evaluation, go with the impairments that I found, and then base decisions on my treatment planning based on what I found on their evaluation. I just basically try to lay out the objective information that I have and then try to make decisions based on previous experience, courses, et cetera, to come with a judgment on how I'm going to use that information. (Experienced participant—Dara 3:8-15)

### Sources of Information

Of the 6 sources of information identified, 4 were consistently identified by participants in both groups: observation of movement behavior, observation of cognitive-perceptual impairments, use of the medical record, and anticipated patient outcomes. The fifth source, use of pro-

ocols, was discussed by experienced participants only; the sixth source, use of the scientific literature, was discussed inconsistently by participants in both groups. Observation of movement behavior (the most commonly cited source of information)<sup>8-10</sup> and use of the scientific literature<sup>40-43</sup> were consistent with previous reports and are not discussed in this article. There were similarities and differences in how the remaining sources of information were used by novice participants and experienced participants.

Novice participants used the medical record to gain information about diagnosis, history of present illness, and past medical history to anticipate the patient's clinical presentation as well as to gain insight into the patient's accuracy as a historian. Galway provided the following example:

I'm looking to see where the stroke was so I can kind of have an idea of what his impairments may be. And then the other things . . . to see what his prior level of function was. . . . And then PMH. . . . The most important thing I was looking for was to see where it was to have an idea which side is going to be affected and this is what to look for. (Novice participant—Galway 1:26-39)

In contrast, experienced participants relied on observations and interactions with patients rather than the medical record, as exemplified by Mayo's comments:

I'll see it and I'll treat what I see. Because I'll look stuff up to get the past medical history and then . . . I just fall right back into what I do . . . you treat what you see, not what you should see. (Experienced participant—Mayo 3:489-493)

Experienced clinicians used the medical chart to provide specific details that informed a decision or clar-

ified information, as Cork demonstrated in the following comments:

At one point I stopped and went back and read her consult because I was seeing things that didn't make sense for what I thought the distribution of motor impairment would be [relative to diagnosis]. And I was looking to see if there was something that would show up as a cerebellar or brain stem type of issue. (Experienced participant—Cork 1 and 2:125-128)

With regard to anticipated patient performance, participants in both groups related instances of making decisions on the basis of information gained from previous observations. The degree of success that novice participants achieved in their CDM processes depended on sufficient experience on which to make informed decisions. Cavan described reliance on an observation of motor impairment, as she had limited experience, to initiate gait training with an assistive device:

I want her to have some active range of motion . . . at the hip. . . . Because if it's active assisted, I won't try to walk with a cane. (Novice participant—Cavan 1:82-85)

In contrast, experienced participants' past experiences provided a comparative framework for how they expected a patient to present or perform under a particular set of circumstances and informed the prognosis. Mayo, an experienced participant, illustrated how past experiences and observation skills directed the plan of care:

Once you do that first walk you should at least have an idea how well they're going to do stairs. How well they're going to do standing, [foot] clearance. How good their strength is no matter what their manual muscle test was. (Experienced participant—Mayo 2:471-474)

With regard to the observation of psychoemotional and cognitive-



perceptual abilities, fewer comments were made by all participants about these types of impairments than about motor impairments. There are 2 reasons for the relative paucity of comments. First, not all patients observed presented with these types of impairments. Second, clinicians had fewer opportunities to assess and treat these types of impairments. Novice participants identified their abilities as “developing” and recognized that they did not have sufficient experience with these types of impairments to accurately inform treatment planning.

The following excerpts are specific to ambulation activities observed between Cavan and a patient (field note 5/26/05)<sup>‡</sup>:

It's hard giving directions because you don't know how much she understands. She kind of anticipates what you want. I might say, “Scoot forward in your chair,” and she would see the bar and think she was supposed to stand up. . . . I don't think she understands. (Novice participant—Cavan 1:18–24)

When we're walking, sometimes I give cues and sometimes I just don't because I don't really think it helps that much. (Novice participant—Cavan 1:28–29)

Cavan's assessments about the patient's performance reflected a trial and error approach to CDM (reflective memo Obs1.6). This trial-and-error approach was evidenced by the other novice participants as well (for Kerry: field note Obs2d and reflective memos Obs2.4 and In2.5; for Galway: reflective memo Obs2.2).

Experienced participants demonstrated the ability to integrate previous clinical experiences and obser-

vations of patients' psychoemotional and cognitive-perceptual deficits with neuromuscular and musculoskeletal impairments. The following excerpt illustrates how these impairments were related to function:

I think that she follows and she hears what I'm saying. I don't think she has a way to get her body to do what I'm asking her to do. But cognitively she can say, “Yes, I want to get my weight over to the left. I want to keep my head and shoulders upright.” I don't think that she always has a method for the body awareness or the understanding of how to accomplish those things. So I think she gets extremely frustrated with this. . . . I don't think she can make her body do what I'm asking her to do. (Experienced participant—Dara 1:162–170)

None of the novice participants identified the use of protocols. Although the concept of protocols was discussed by all 3 experienced participants, formal protocols were not a component of CDM and were not incorporated into daily clinical practice for neurologic rehabilitation by these participants.

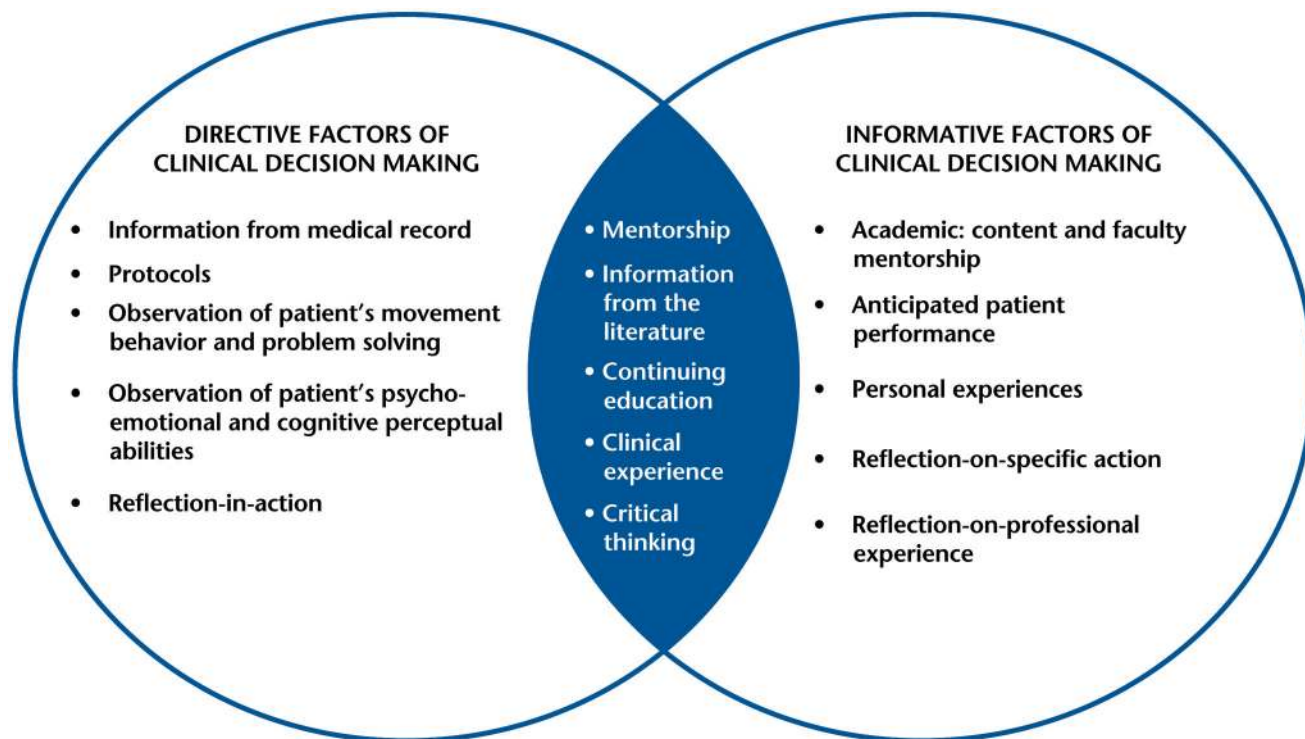
## Discussion

Insight into the CDM of novice clinicians has been gained relative to what is known about expert practice by physical therapists. We selected experienced participants, rather than experts, to serve as a reference group for assessing the CDM processes and abilities of novice participants. Although we did not apply the standard selection criteria for “experts”<sup>11</sup> to the experienced participants who served as a reference group, these participants did demonstrate abilities consistent with those exemplified by physical therapist experts.<sup>8–10,12,13</sup> Through examination of the differences between novice physical therapists and experienced physical therapists in the context of prior experience, we developed a model of the factors that affect CDM.

The observations and interviews provided insight into how the participants made decisions as well as how prior experience contributed to the development of CDM abilities and informed ongoing CDM processes. The factors that influenced CDM could be categorized on the basis of their relationships to the CDM abilities and the CDM processes that each participant used. Figure 2 identifies the factors that informed the CDM of participants in the present study. This Venn diagram depicts factors that influenced CDM abilities as “informative factors” and those that influenced CDM processes as “directive factors.” The themes incorporated by the informative factors were professional experience, personal experience, and reflection (specific to reflection-on-action activities). Informative factors contributed to the development of the abilities, clinical reasoning, and behaviors used by participants in daily clinical practice. These factors included experiences and activities that occurred away from the treatment session, whether that time away was minutes or hours (reflective activities) or was longer (academic or continuing education). Directive factors influenced decisions during the treatment session. These factors provided information, primarily through observation and reflection-in-action, for making immediate decisions during therapist-patient interactions. The factors in this category spanned 2 themes: reflection and CDM.

Across-case analysis provided insight into differences in how novice participants and experienced participants used these directive and informative factors to make decisions. Although novice participants and experienced participants often made similar clinical decisions, they used different thought processes reflective of their levels of experience to arrive at their decisions. Novice par-

<sup>‡</sup> Format for reflective memos and field notes is: data source, observation (Obs) or interview (In), number for each data source, and number or letter corresponding to researcher's note or memo.



**Figure 2.** Comparison of informative factors and directive factors that influence clinical decision making.

ticipants were more likely to rely on informative factors, whereas experienced participants more frequently used directive factors.

Both experiential knowledge and conceptual knowledge are necessary to develop abilities to appreciate and selectively attend to pertinent features of a task or problem.<sup>44</sup> Because novice clinicians have limited experiential and conceptual knowledge, they are confronted with a high degree of uncertainty and are challenged when attempting to make effective clinical decisions. This situation was demonstrated by the trial and error approach that novice participants used when working through a clinical dilemma.<sup>45</sup>

Factors that informed CDM processes but were not shared by the participant groups reflected differences in the depth and breadth of prior clinical experience. Consistent

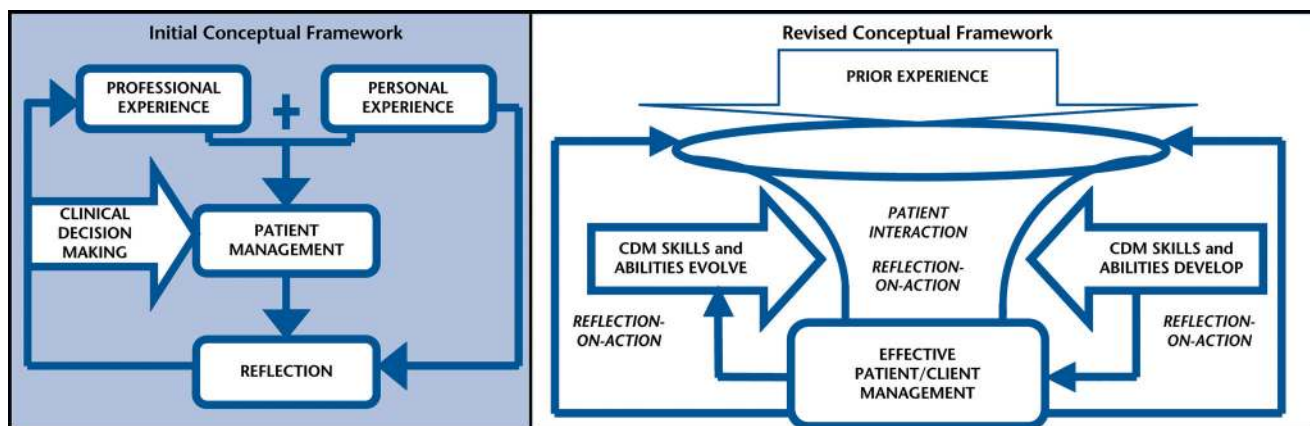
with previous reports, experienced participants used forward reasoning processes<sup>2</sup> as well as observations and interactions with patients during treatment sessions<sup>8,9</sup> to arrive at clinical decisions. In contrast, novice participants relied on external sources of information, such as the medical chart (discharge information) and the *Guide to Physical Therapist Practice*,<sup>1</sup> to direct CDM. Novice participants had not yet developed an organized system for collecting patient data, nor did they have an established script from which to work. Therefore, they created structure by using external sources to confirm their decisions. In this way, novice clinicians attempted to reduce the amount of uncertainty with which they were confronted.

Several factors within the themes of CDM and professional experience spanned the directive factor and informative factor categories. These

factors were skills or behaviors that were learned (such as critical thinking or use of the scientific literature) and mentoring relationships that were developed over time. These relationships, skills, and behaviors provided the participants with the tools that are the foundation of CDM and that are also part of the immediate and ongoing nature of CDM.

All of the participants identified several professional experiences as meaningful in developing CDM abilities. These experiences included mentorship, formative clinical experiences, and a strong educational background, whether it was excellent professional education (primarily noted by novice participants) or continuing education (as described by experienced participants).

Consistent with previous reports,<sup>8-10,46</sup> all participants relied on observations of a patient's move-



**Figure 3.** Evolution of the initial conceptual framework to the revised conceptual framework for the interaction of clinical decision making (CDM) and reflection within the patient/client management model.

ment behavior as primary sources of information. Differences between novice participants and experienced participants were characterized by the degree to which they used formalized illness scripts. The thought processes of novice physical therapists reflected a focused link between 1 impairment and a functional activity. In contrast, more experienced physical therapists relied on broader observations of a patient's abilities at both the impairment and the functional limitation levels. Experienced participants evaluated and synthesized their thoughts about multiple impairments, including cognitive and psychoemotional factors, when thinking about the patient's function. This ability to anticipate patient performance separated them from novice participants and was consistent with the use of illness scripts as described by Schmidt et al.<sup>2</sup>

The attributes of novice and experienced participants' CDM affirmed the model of clinical reasoning processes.<sup>4,5</sup> All novice participants demonstrated hypothetico-deductive processes, including the generation of multiple hypotheses. Their CDM processes were characterized by difficulty with atypical cases, an un-

organized approach that often led to errors of omission and commission, and limited recall of patient data. In contrast, experienced participants used forward reasoning processes. They were selective about data collection and used the data to generate hypotheses. They were able to deal with atypical cases as a matter of course and were able to recall information in an organized fashion.

Examples provided by novice participants revealed that their interpretations of clinical data were discoveries, as detailed by Kerry:

And with him I was pretty surprised. . . . I didn't think he would do as well as he did. (Novice participant—Kerry 2:98)

In contrast, the interpretations provided by experienced participants were concise descriptions of preconceived treatment plans:

I'm hoping for some carryover from her ability to do these things on the mat to the more challenging sitting and standing activities. (Experienced participant—Dara 1:91-98)

Although there were distinct differences between novice participants and experienced participants, Gal-

way, a novice participant, provided responses and demonstrated abilities that were consistent with intermediate practice.<sup>3,4</sup> He was the only novice participant to recognize and internalize behaviors modeled by his mentors. He demonstrated and valued abilities, such as clinical teaching, that were more consistent with the abilities of more experienced clinicians. These differences between Galway and the other novice participants were most likely related to the nature and depth of his prior experience and his ability to incorporate reflection into the CDM process. After he earned a baccalaureate degree, he was employed as a physical therapist aide for 2 years (artifact in the curriculum vitae for Galway) before beginning his physical therapist education. The time spent in this environment as well as the mentoring relationships that he developed (reflective memos In3.1 and In3.2) provided him with experiences and abilities that he applied throughout his entry-level physical therapist education.

The revised conceptual framework is shown in Figure 3. It is clear that experience is essential for the development of CDM skills and abilities across the spectrum from novice

through intermediate to experienced. The nature of experience shapes how and to what extent CDM skills and abilities develop. In addition to taking advantage of experiential learning opportunities, a novice student or clinician must develop skills for reflection<sup>47</sup> to achieve autonomy, expertise, or both in the decision-making process. Based on previous work, the revised conceptual framework recognizes and incorporates the concurrent roles that reflection plays in the development of CDM abilities and CDM processes. The use of reflection is iterative as clinicians apply directive and informative factors throughout their interactions with patients. Illustration of the interaction between reflection and CDM, as well as the classification of CDM abilities and CDM processes, provides a framework for professional development from novice through intermediate to experienced practice. Placement of this conceptual framework beside models of expert practice in physical therapy<sup>8-10</sup> can provide an understanding of the continuum of development of CDM in practicing physical therapists.

Academic and clinical educators have the responsibility to create experiences that provide students with opportunities to develop and hone their CDM abilities. It is a challenge to provide, in academic and clinical settings, learning experiences that facilitate CDM skills and abilities along the continuum of professional development. Each student's prior personal, academic, and clinical experiences shape his or her ability to develop these skills as entry-level Doctors of Physical Therapy.

Like novice clinicians in medical practice,<sup>3,6,45</sup> the novice participants in the present study acknowledged uncertainty, surprise, and experimentation in CDM processes consistent with the elements of Schön's model of reflective practice.<sup>48</sup> Schön's

model provides a framework that academic and clinical faculty can use to facilitate learning for students and novice clinicians. Crandall stated that the use of Schön's model to develop instructional activities and learning experiences allows learners to organize knowledge and skills around practice; recognize and address the conflicts, ambiguity, and uniqueness of each case; construct and reconstruct knowledge around the surprises that they encounter; experiment carefully, wisely, and effectively to address conflicts, ambiguity, and uniqueness; and reflect on their professional performance and alter practice appropriately.<sup>49</sup>

Recognizing that the development of CDM skills and abilities does not stop upon the completion of entry-level education, clinicians should be evaluating their professional development relative to these skills and abilities. Clinicians should seek out employment and professional networks that provide the mentoring and resources necessary for ongoing professional development. Necessary resources include time, access to technology, opportunity, and (financial) support for ongoing education and professional environments that nurture and provide formative feedback. For novice clinicians seeking employment, these elements seem to be more critical than practice setting.

Experienced clinicians inevitably become mentors to novice clinicians. However, these experienced clinicians may be challenged with finding mentors who can facilitate their continuing professional development. Developing peer-peer mentoring networks and continuing to seek out mentors to meet evolving professional development goals are activities that should be pursued.

The present study has provided a deeper understanding of the differences in CDM processes and abilities

between novice participants and experienced participants within the context of prior experience. Although the research design afforded the opportunity to observe each participant with 1 patient in 2 physical therapy sessions, it may have narrowed the breadth of the participants' perspectives on CDM. Responding to the semistructured interview questions grounded in the participants' observations and reviewing each videotaped treatment session within the context of their interactions with only 1 patient may have narrowed the focus of their responses.<sup>40</sup> Although collecting observations and data in 1 type of clinical setting increased the likelihood of similar clinical experiences between participants, it limited the extent to which the results may be applied to clinicians in other clinical settings. However, these limitations do not prevent using the results of the present study to lay the groundwork for further study of the use of reflection to inform CDM processes.

The results of the present study may be used by academic and clinical educators to develop and structure learning experiences to facilitate CDM and reflection for novice clinicians or students. Novice clinicians will benefit from knowing which activities and processes could facilitate the development of "mature" CDM. In turn, clinical managers may choose to apply the results of the present study to structure professional development activities for novice and experienced staff members. Ultimately, recognition from each stakeholder's perspective of the experiences, behaviors, and abilities that influence the development of CDM could facilitate the professional development of all physical therapists.

All authors provided concept/idea/research design. Dr Wainwright, Dr Shepard, and Dr Harman provided writing. Dr Wainwright provided data collection and analysis and

project management. Dr Harman provided consultation (including review of manuscript before submission).

The study was approved by the institutional review boards of the University of the Sciences in Philadelphia, Temple University, and Magee Rehabilitation Hospital.

This article was submitted May 11, 2010, and was accepted September 7, 2010.

DOI: 10.2522/ptj.20100161

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### Appendix 1.

Semistructured Interview Question Guide: Think-Aloud Videotape Analysis Interviews

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These 2 interviews were conducted within 1 week of the corresponding videotaped sessions. The questions were presented in a nonscheduled, nonstandardized format.

Introduction: I have selected several portions of the videotape for you to review. I would like you to share your thoughts about what you were thinking while treating this patient. Do you have any questions?

1. What are you doing in this portion of the tape?  
For what purpose are you doing this?  
What about this patient indicated that this would be an effective intervention?  
How did you come to know to try this? Where/from whom did you learn this?
2. I would like to move on to another segment. (This will occur 3 or 4 times throughout the interview.) Repeat questions above.
3. How does what's happening in this segment compare to what happened in the previous segment?
4. When do you opt to \_\_\_\_\_ rather than \_\_\_\_\_?
5. Is this treatment session indicative of a "typical" treatment session?
6. How would you describe your clinical reasoning processes? That is, can you tell me step by step how you \_\_\_\_\_?  
How have these thought processes evolved?
7. If this is not a typical session, what was different about this treatment session?
8. Is there anything else you want to tell me about the treatment sessions and how you make clinical decisions?

## Appendix 2.

Semistructured Interview Question Guide: Interview About the Role of Prior Experience in the Development of Clinical Decision Making and the Reflection Process

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Introduction: The purpose of this interview is to gain insight into your thoughts about how your personal and professional experiences have shaped your clinical decision-making processes.

1. Tell me what you think clinical reasoning is.
2. What do you think reflection is?
3. How is clinical reasoning tied to reflection?

Résumé Sort Instructions: You have provided me with a copy of your résumé. I have placed each item from your résumé on a separate card. I would like you to place each card in 1 of 3 piles:

- Those experiences that have been *most important* in developing your clinical decision-making abilities.
- Those experiences that have been *somewhat important* in developing your clinical decision-making abilities.
- Those experiences that have *not been important* in developing your clinical decision-making abilities.

Résumé Sort Questions:

4. You have identified X experiences as being most important in developing your clinical decision-making abilities.
  - a. How were your clinical decision making abilities developed during X experience? Y experience? Etc . . .
  - b. What similarities were there between these experiences that you identified as being most important? What differences?
5. You have identified X experiences as being somewhat important in developing your clinical decision-making abilities.
  - a. How were your clinical decision-making abilities developed during X experience? Y experience? Etc . . .
  - b. How were these experiences different from those that were most important?
6. You have identified X experiences as not being very important in developing your clinical decision-making abilities.
  - a. How were your clinical decision-making abilities developed during X experience? Y experience? Etc . . .
  - b. What was the nature of these experiences that made them “not very” important?

Example Question: I would like to you answer the following question.

7. Tell me about an instance when you used reflection to assess your clinical decision making in patient management.

Closing Questions:

8. What would you tell a coworker who was thinking of taking this job with the goal of improving clinical decision-making and reflection skills?
9. Is there anything else you want to tell me about your use of clinical decision-making skills and reflection in patient management?