Southern California CSU DNP Consortium

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# REDUCING NURSE PRACTITIONER MEDICAL ERRORS: AN EBP GUIDELINE WITH A REFLECTIVE PRACTICE ALGORITHM

A DOCTORAL PROJECT

Submitted in Partial Fulfillment of the Requirements

For the degree of

DOCTOR OF NURSING PRACTICE

By

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## ABSTRACT

In 2000, medical errors (ME) leading to preventable deaths have been estimated to be 44,000 to 98,000 by the Institute of Medicine (IOM) and then revised to approximately 400,000 deaths annually in recent studies. These studies also reflected associated costs between $17 to 29 billion dollars. Failure to diagnose (FTD) is a type of ME and it is the most common type of diagnostic error committed in primary care outpatient settings. FTD represents 26.59% out of 47% of errors that have been linked to preventable deaths. As a result of these diagnostic errors, NPs experience increasingly higher medical malpractice claims. To mitigate this, experts strongly recommend strategies to reduce diagnostic errors. While education is available on how to diagnose medical conditions, there is limited education on strategies on how to reduce diagnostic errors.

The purpose of the project was to develop, educate, and evaluate the effectiveness of a training workshop using an evidence-based educational guideline, titled Integrated Diagnostic Practice Guideline (IDPG). An evidence-based review of the literature was performed and an algorithm created by the synthesis of the Logic and Reflective Practice models. The objective was to educate NPs on IDPG with the aim of assessing their confidence pre-training and post-training as well as the NP's intent to change by incorporating the IDPG into their practice.

This was a quality improvement (QI) project using a descriptive, non-experimental design with a convenience sample from the California Association of Nurse Practitioner (CANP) members, who were Adult/Primary Care NPs working in outpatient settings. The validated assessment tool, the Confidence Scale (C-Scale Survey) by Susan

Grundy (1993) was utilized to evaluate knowledge level pre-training and post-training. A paired sample *t*-test was used to compare the mean scores between pre-training and post-training. T-test results from the C-Scale assessments were used to determine if there was a significant difference in knowledge transfer and confidence with the training. Also, post-training, the validated evaluation tool called Organization Readiness for Implementing Change (ORIC Survey) by Shea et al. (2014) was utilized to assess the NPs intent to change practice by assessing their willingness to implement the IDPG. The demographic data of the NP sample, their practice settings, and post-training ORIC survey results were measured using descriptive statistics of frequencies counts and means. A post-training, Pearson correlational analysis assessed the sum scores of the post-training C-Scale and the sum scores of the post-training ORIC to determine if there was a relationship between knowledge gained and intent to change practice.

A paired sample *t*-test revealed a statistically significant difference between the total C-scale pre-training and post-training ($M$ = -6.971, $SD$ = 5.351 $t(-7.596)$ = 33, $p < .001$). Also, there were statistically significant differences across the five items of the C-Scale between the pre-training and post-training of the 34 participants. These results demonstrated that participants had an increase in confidence after the training. The analysis of the descriptive statistics of the ORIC survey post-training revealed the mean score of 4.29 to 4.41, with a standard variation range of .109 to .132 across the ten questions of the ORIC in the post-training. The results of the ORIC post-training surveys indicated a high level for intent to change by incorporating the IDPG into their practices. A Pearson correlation test between the sum post-C-Scale and the sum post-ORIC survey revealed a statistically significant relationship between the confidence level of the

participants on the IDPG and the intent to change post-training, ($r(32) = .365$, $p = .034$). The correlations indicate that the knowledge gained using the IDPG significantly correlated with increased confidence and the likelihood of intent to change practice.

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strength, hope, and courage. Mai, I hope I have made you proud!  Above all, Thank you, God, for making this dream comes true!

## BACKGROUND

In the report, "To Err Is Human," the Institute of Medicine cited there were approximately 44,000 to 98,000 preventable deaths each year due to hospital medical errors (IOM, 2000). At that time, medical errors (MEs) were noted to be the eighth leading cause of death in the U.S (Kohn, Corrigan, & Donaldson, 2000). However, recent studies show that the IOM had grossly underestimated the number of preventable deaths due to MEs. Multiple sources such as medical records, autopsy reports, and death certificates have been examined since the first IOM report in 2000. The latest studies showed that MEs have risen to become the third most common cause of death in the U.S. Medical errors were found to be responsible for more than 400,000 deaths per year, four times more than the IOM had originally indicated in 2000 (James, 2013; Kohn et al., 2000; Makary & Daniel, 2016; Sweeney, LeMahieu, & George, 2017). The yearly costs associated with MEs are estimated to be between $17 billion to $29 billion (Berge & Mamede, 2013).

Failure to diagnose (FTD) is a type of ME. It is an unintentional omission or failure to timely and accurately diagnoses a medical condition as a result of a breakdown within the diagnostic process (Balla, Heneghan, Goyder, & Thompson, 2012). Key contributing factors have been linked with FTD and identified in the literature. Medical Doctors (MDs), Physician Assistants (PAs), and Nurse Practitioners (NPs) have all committed the following failures in the diagnostic process: failure to gather a complete medical history, to perform thorough physical examination, order diagnostic studies, consider differential diagnosis and recognize cognitive bias (Balla et al., 2012; Ely, Kaldjian, & D'Alessandro, 2012; Singh et al. 2013). Although the breakdown in the

diagnostic process has been cited most often as the cause of MEs, these errors are often due to knowledge gaps (Balla et al., 2012). These same studies have also identified the lack of reflection as the main reason behind failure to thoroughly gather all essential medical information necessary to properly form a correct diagnosis. -Furthermore, the limited time spent evaluating patients; especially in the primary care setting has also been associated with MEs and medical malpractice claims (Al Qahtani et al., 2016; Dugdale, Epstein, & Pantilat, 1999; Levinson, Roter, Mulloly, Dull, & Frankel, 1997).

The role of the NP in the adult/primary care setting represents a critical component of the primary healthcare system in the U.S. The proportion of NPs entering primary care practice between 2010 and 2025 is expected to increase from 19% to 29%, while MDs are expected to continue to decrease during that same period from 71% to 60% (Auerbach et al., 2013). With more NPs entering the primary care setting, the risk of potential malpractice claims increases for them (Sweeney et al., 2017). The increase in claims results in the need for NPs to have expanded levels of medical malpractice insurance coverage.

The Nursing Service Organization (NSO) is a national company that has provided insurance coverage for nurses and NPs since 1976. This organization has developed a clearinghouse of information related to care based on detailed analyses of closed claims of medical malpractice cases. A recent claim report indicated that adult primary care and family NPs had an average closed claim (those claims that are resolved) payout of $250,000 to $260,000 which contributed significantly to an increase in annual medical expenses (NSO, 2015). In an attempt to educate NPs on general MEs and their adverse impact on patients and providers, the NSO has been conducting workshops to increase

awareness of the types of malpractice claims. However, NSO's education does not include a focused approach to mitigating diagnosis-related MEs or addresses key barriers with specific tools such as the use of reflection to recognize cognitive bias within the diagnostic process.

Leigh and Lynn (2013) indicated that few recommendations are available for NPs to help reduce the risk of FTD. Due to the lack of education for NPs regarding diagnosis-related MEs, Sweeney et al., (2017) recommended to the American Association of Colleges of Nursing (AACN) that nursing curriculum should include ME prevention. IOM (2015) recently recommended for the health care professional to have appropriate education on the effective strategies to achieve competencies on the diagnostic process. Experts believe that the problem is a lack of education on strategies to minimize the risks of making diagnosis-related MEs, not a deficiency in education on the standards of practice (Sweeney et al., 2017; Leigh & Lynn, 2013; Singh et al., 2013). One strategy that should be included in the curriculum is the practice of reflection (Mamede & Schmidt, 2005). Often NPs minimize or overlook the practice of reflection. Reflective practice has been cited as an important strategy for NPs to be able to thoroughly assess, evaluate, and prevent a FTD ME from occurring (Mamede & Schmidt, 2004; Mamede, Schmidt, & Penaforte, 2008). Furthermore, reflection in combination with a practice checklist as part of a structured process or algorithm has been shown to reduce MEs (Ely, Graber, & Croskerry, 2011; Balla et al., 2012; Singh et al., 2013).

## Problem Statement

Failure to diagnose is the ME that represents one of the most significant medical malpractice issues in the primary care setting for adult/primary care NPs (Brock,

Nicholson, & Hooker, 2017; Sweeney et al., 2017). It causes significant adverse financial, emotional, and physical costs to the patient as well as the provider. A detailed review of closed malpractice claims from the national NP database shows that within the diagnosis-related category, FTD was most prevalent (26.59%) followed most closely by the delay to diagnose (11.31%) with misdiagnoses accounting for only 3.15% of all paid NP claims (Sweeney et al., 2017). Hence, FTD is the most common error committed by NPs and represents a significant opportunity for practice improvement. There is a need to develop an evidence-based practice guideline that provides a specific algorithm that uses a strategy such as reflective practice principles for reducing FTD by adult and family NPs in the primary care setting.

## Purpose Statement

The purpose of this Quality Improvement (QI) project is to develop and deliver an evidence-based practice guideline in the primary care setting for use by adult/primary care NPs that provides a specific algorithm using reflective practice techniques. The guideline will assist NPs in reducing the risk of committing a FTD ME. The project will include an examination of contributing factors identified in the literature related to FTD MEs. Once contributing factors have been identified, methods for reducing potential adverse outcomes will be incorporated into the evidence-based practice guideline that includes reflective practice, checklists, etc. Changes in knowledge and intention to implement the guideline into NP primary care practice will be measured as part of the project. The desired long-term goal, post-DNP project, would be that the NPs who attended the education would implement the algorithm in their daily clinical practice.

## Logic Model and Reflective Practice Model

Bonnel and Smith (2014) indicated that a framework provides the foundation for the concepts and definitions used within a project, as well as outline the use of the instruments for the project evaluation. There are two (2) models that when combined provide a synthesis for explaining the project and the intervention to be used within the project; the Logic Model and the Reflective Practice Model.

First, the Logic Model will serve as the underpinning for what needs to be done with respect to the project. It will provide a comprehensive plan to guide, implement, and evaluate the development and implementation of the evidence-based practice guideline (Knowlton & Phillips, 2013). The use of the Logic Model is appropriate because it helps to explain the complex relationship between the FTD MEs and associated contributing factors. The Logic Model also addresses the implementation and evaluation of the educational guideline to lead to an increase in awareness among NPs about the issue of FTD within professional practice.

Next, the Reflective Practice Model will serve as the intervention for the project. It will provide NPs with both an instructional teaching guide and a strategy for optimizing the diagnostic process (Mamede et al., 2008). Also, the Reflective Practice Model is appropriate for this Doctor of Nursing (DNP) Project because it will engage NPs to critically evaluate their perceptions, attitudes, and feelings associated with the processes of diagnosis (Mamede & Schmidt, 2004).

## The Logic Model

The Logic Model is made up of five key components: 1) inputs and resources, 2) outputs/activities, 3) outcomes, 4) external factors, and 5) assumptions (see Figure 1).

First, inputs and resources are the assets that are invested in the project and usually consist of organizations, stakeholders, and financial resources (Knowlton & Phillips, 2013). Resources for this project include the stakeholders from the organization of the California Association for Nurse Practitioners (CANP) and its chapter leaders, board members, and its members. The mission of CANP is to promote and protect the integrity of the NP profession and serve as an advocacy group for NPs by providing education.

Second, outputs and activities consist of actions and strategies that will be implemented to enhance awareness of FTD MEs. The Reflective Practice Model will serve as a guide for teaching advanced learners on how to engage in critical thinking. Outputs and activities will include the development of the evidence-based practice guideline which will be comprised of an algorithm for engaging in the diagnostic process of Reflective Practice. The activity will be accomplished through the use of an educational program for NPs. Other activities will include the administration of pre and post-learning tests to assess knowledge of the FTD MEs and to assess the NPs intent to change their practice to include the algorithm.

Third, outcomes are the impact of the activities as short-term, intermediate, and long-term goals. The short-term goals of this project include evaluating the understanding of content before and immediately after the educational in-service via a pre and post-test. The intermediate and long-term goals cannot be assessed due to the time limitations of the project.

Fourth, external factors will be addressed. An external factor is an occurrence that is beyond the control of the project parameters (McClaughlin & Jordan, 2004).

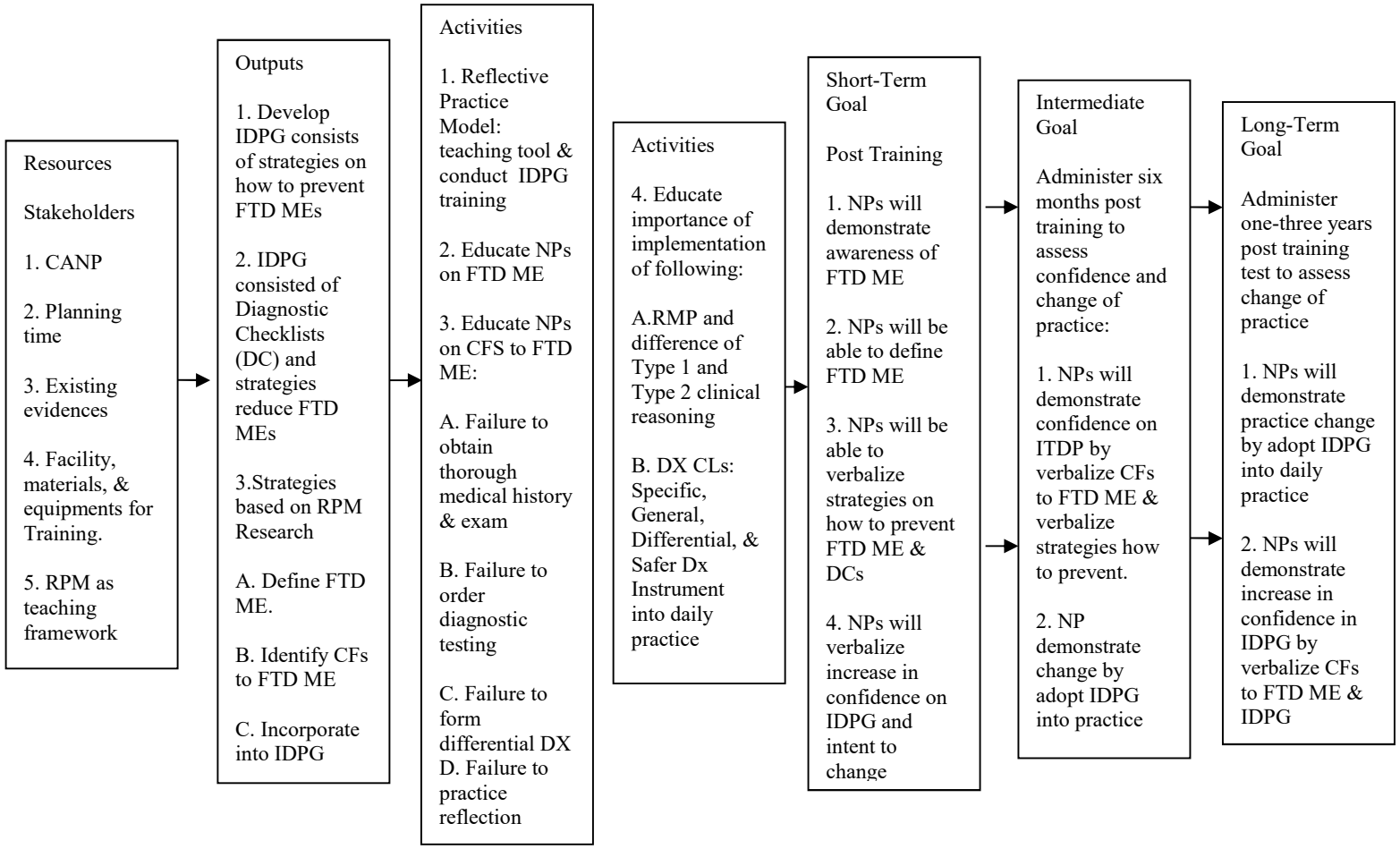


*Figure 1.* Strategies and steps of the Logic Model

Note. Adapted from The Logic Model Guidebook: Better Strategies for Great Results (p. 9), by L. W. Knowlton and C. Philips, 2013, Copyright 2013 b Thousand Oaks, CA: Sage Publications, Inc. Adapted with permission.

The most significant external factor that will impact this project is time. Time is required to properly and thoroughly reflect on each patient's clinical presentation. Time is needed to engage in Reflective Practice (Al Qahtani et al., 2016). The time can be spent as part of the clinical encounter with a patient. Whether the NP chooses to make Reflective Practice part of the actual clinical encounter or use it at a later time is beyond the control and parameters of this project.

Finally, the fifth component are the assumptions that outline the project. One assumption is that time is the underlying factor that will need to be acknowledged when engaging in Reflective Practice and this can either impede or facilitate the outcome of a decrease in FTD (McClaughlin & Jordan, 2004). Due to the time required to assess a patient's complaints adequately, it is assumed that the provider dedicates time to reflection. Also, it is an assumption that NPs will participate in the educational program because it fulfills their need for continuing education units and topic content as part of their professional practice licensure requirements. Another assumption is that NPs as professionals are concerned with engaging in best practices for patient safety and thus would be interested in obtaining knowledge regarding the educational program. A final assumption for the project is that the quality of the time spent of reflection is critical for linking it improved patient care through the application of this evidence-based algorithm with a diagnostic checklist.

## Reflective Practice Model

Reflection is defined as the thoughtful, intentional deliberation and focused thinking through the application of induction, deduction and critical analysis (Mamede et al., 2008). The act of reflection is the process of deep thinking and reasoning that will

develop a deeper understanding of self (Mamede et al., 2014). The author also notes that engaging in Reflective Practice is associated with improved quality of care, and inspiring personal and professional growth. Reflective Practice is considered to be an advanced teaching and practice tool recommended for integration into nursing and medical curriculum because it can enhance critical reasoning and clinical performance (Mamede & Schmidt, 2004). The components of the Reflective Practice Model (see Figure 2) consist of five strategies that may overlap and occur at the time of and after a clinical encounter and evaluation (Mamede & Schmidt, 2004). These strategies are not a step-by-step process, but rather shift back and forth between the different behaviors in the model: deliberate induction, deliberate deduction, hypothesis testing, openness toward reflection, and meta-reasoning.

First, deliberate induction includes the tendency to search for other possibilities or explanations under uncertain or complicated circumstances. (Mamede & Schmidt, 2004). This phase is a period of ambiguity and involves taking time to identify the problems that need to be solved. This phase is important because NPs may either choose to ignore or face the issues of uncertainty. If they choose to face the issue, they can use the Reflective Practice Model to process it (Dewy, 1933). When NPs ignore their feelings of uncertainty, they increase the likelihood of FTD ME (Graber et al. 2012; Mamede et al. 2008).

Therefore, teaching NPs to practice deliberate induction has the potential to reduce the risk of FTD MEs significantly. The NPs that are taught how to confront feelings of uncertainty when presented with a clinical challenge by searching for all potential possibilities or answers, asking further questions, reviewing past medical

history, and performing a thorough physical exam will then be most likely be able to avoid or reduce the number of FTD MEs.

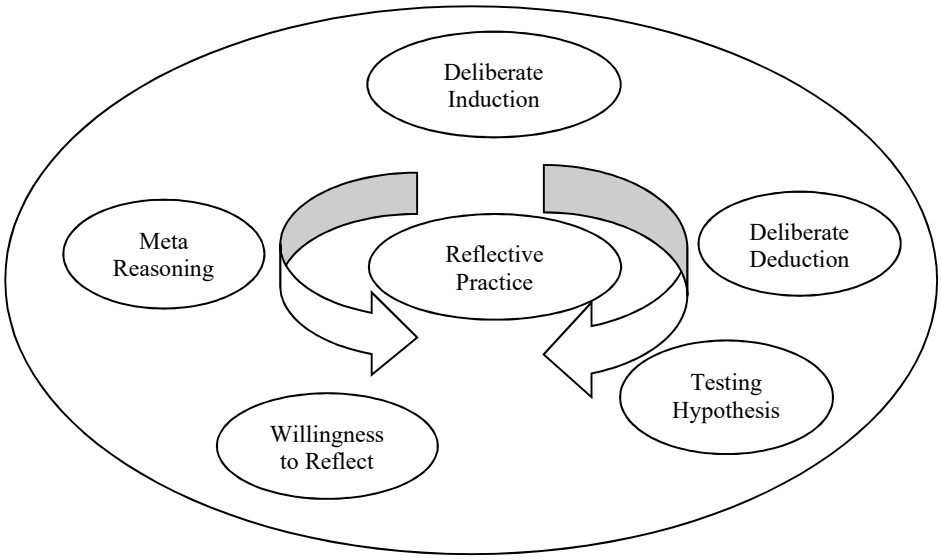


*Figure 2.* Elements and dynamics of Reflective Practice Model

Note. Reflective Practice Model by Mamede & Schmidt, inspired by Dr. Dewy. The structure of reflective practice in medicine. *Medical Education*. Copyright 2004 by Blackwell Publishing Ltd. Adapted with permission.

Second, deliberate deduction involves the cognitive behavior of exploring the results of alternative explanations or possibilities. Using deliberate deduction, NPs can explore other signs and symptoms by asking additional questions to confirm or rule out medical conditions or differential diagnosis. The deliberate and logical gathering of potential differential diagnoses, based on the information obtained from the clinical presentations, can be integrated into the list of differential diagnosis. After the formulation of differential diagnosis, the NP could further delineate the diagnosis by ordering diagnostic testing to rule in or rule out the differential diagnosis on the list.

The third behavior is testing the diagnostic hypothesis. It is a critical component of proper diagnostic procedures and requires intentional linkage with the types of tests and evaluations performed to validate the diagnosis (Dewy, 1933; Mamede et al., 2008). Testing the hypothesis helps to confirm the diagnosis and rule out a differential diagnosis by taking further history, examination, and diagnostic testing.

The fourth behavior is the attitude of openness toward reflection, consisting of the willingness to critically evaluate medical conditions. Openness toward reflection is essential because the desire to reflect is the beginning phase of critical reasoning. When providers are not open to practice reflection, the established routine may intentionally follow and clinical decisions will be based on old habits and biases (Mamede et al., 2013). Therefore, ignoring, failing to take time to learn, or lacking the willingness to reflect, and failing to seek consultation can all lead to a FTD ME.

The fifth behavior is meta-reasoning, which consists of critically reviewing or analyzing conclusions, assumptions, or beliefs. This phase is a critical part of the analysis because it is the methods used by clinicians to evaluate biases or deficiencies. Comprehensive reasoning allows the provider to reasonably assess, evaluate, diagnose, treat and reassess again, if necessary.

As a provider engages in behaviors of reflection, they create a chain of events which may or may not lead to a correct diagnosis. If the first action or intervention was incorrect, then the sequence of the events was also incorrect (Dewey, 1933). For example, if a provider mistakenly treated a patient for heartburn, then the consecutive chain of evaluation and diagnostic testing would be different than if the provider had treated the patient for a heart attack. Subsequently, once the provider discovers the error,

the chain of evaluation must begin all over again at the deliberate induction phase of reflection to maximize the opportunity for a correct diagnosis. The provider should re-evaluate patients by reassessing at the beginning and by taking a new history, physical and ordering different diagnostic testing where appropriate. When a provider misses any phase of the reflective practice process while evaluating a patient during the diagnostic phase, the provider needs to restart at phase one. Each behavior is a step in a sequence that has consequences that result in consecutive events that build on one another (Dewey, 1933). Should a provider not restart the reflective practice phase back at deliberate induction, the reflective process would be incohesive, incomplete and not sufficient to obtain an accurate diagnosis. The return to phase one from a restart, may not involve the same level of intensity of evaluation since the provider has gathered much of the necessary information to form an alternative diagnosis. A synthesized model has been derived that combines the foundation built from the logic model and the strategy for intervention outlined by the Reflective Practice model. The authors granted the permission authorizing the use of the Logic Model (see Appendix A) and Reflective Practice Model (see Appendix B) for the purposes described in this project.

## Review of Literature

A literature review was conducted utilizing the databases One Search, Google Scholar, Cochran Library, PubMed, CINAHL, and EBSCO. A step-wise procedure for searching the literature was followed. First, the following terms were searched as both primary categories and in combination with each other: primary care, medical malpractice claims, diagnosis-related MEs, MEs, FTD, NPs, contributing factors, strategies, recommendation, prevention, and education. Next, additional search terms

were added based on the initial search results and included: outpatient, physicians, physician assistant, national practitioner data bank (NPDB), and information technology. Then, all primary and secondary search terms used alone and in combination with each other to elicit the largest possible number of articles relating to the project were searched. Additionally, reference sections from the Journal for Nurse Practitioners and the Journal of Legal Practice were searched to determine if additional focused systematic reviews or other relevant studies referenced in the gray literature could be identified. Finally, search limitations used to narrow the findings to the most relevant period included English language articles published from 2013 to 2018.

Another focused literature search was conducted specifically to evaluate research related to the use of the Reflective Practice Model for clinical diagnostic processes. Key search terms included: Reflective Practice Model, cognitive reasoning, clinical reasoning, reflective practices for nurses, reflective practice checklist, pre-post test methodology, and intent to change practice. This search was conducted utilizing the databases PubMed, CINAHL, EBSCO, Google Scholar, Cochran Library, and One Search. Inclusions were journals and books published in English from 2013 to 2018. Articles were selected if they related to criminal prosecution for medical negligence, criminalization of mistakes in nursing, disciplinary action due to medical malpractice claims, negligence or mistake, in-patient/hospital ME, and any other MEs. The literature search yielded 147articles of which 103 articles met the inclusion and exclusion criteria and were utilized as references for the current project. Further, any studies related to the Reflective Practice Model and Reflective Practice that were found outside of the

publication date parameters were evaluated and included to establish the credibility of the model for use by NPs.

To understand the frequency and severity of FTD MEs, the prevalence of diagnosis-related MEs and examination of contributing factors were explored and are detailed in the following sections of this literature review. Additionally, the extraneous variables of the diagnostic process that are beyond the control of this project are noted and will be briefly reviewed. Finally, while there is no clear intervention that has been identified for addressing the problem of FTD MEs, the use of Reflective Practice using a checklist to reduce the risk of MEs due to FTD has been identified as a viable strategy that should be evaluated further (Ely et al., 2011; Mamede & Schmidt, 2004; Mamede et al., 2013).

## Failure to Diagnose Medical Errors

Diagnostic errors consist of FTD, delay in diagnosis, and misdiagnosis. Allegations of malpractice due to diagnostic-related MEs were the most prevalent medical malpractice claims among adult/family Primary Care Physicians (PCP), PAs, and NPs (Sweeney et al., 2017). Diagnosis-related MEs are the most common allegations made toward NPs, accounting for 41.46% of all NP malpractice claims (Sweeney et al., 2017). Additionally, claims for MEs related to FTD, delayed diagnosis, and misdiagnosis (also known as diagnostic errors) often have some of the highest total medical malpractice payouts. Besides the financial impact of diagnostic errors, there is also a morbidity and mortality aspect associated with diagnostic errors. Diagnosis-related errors resulted in disability or death 36.5% of the time between the years of 1986 to 2010 (Tehrani et al., 2013). For NPs, diagnostic errors are often higher in certain medical care

settings than others. A majority of the claims against Adult/Family NPs and other PCPs occurred in the outpatient setting (Sweeney et al., 2017; Tehrani et al., 2013). Lastly, diagnostic errors can often occur because providers fail to follow a thorough diagnostic process. The diagnostic process includes a thorough medical history and physical examination, requesting orders and interpreting diagnostic tests, formulating differential diagnoses, and being aware of cognitive bias (Balla et al., 2012; Goyder, Jones, Heneghan, & Thompson, 2015).

**Contributing Factors Related to Failure to Diagnosis Medical Errors**

Upon review of the selected articles, several recurrent themes were identified as contributing factors to FTD MEs. The common recurrent themes that contribute to the FTD ME were the failure to perform the following: a) obtain a full medical history and physical examination, b) order diagnostic studies c) formulate a differential diagnoses, and d) recognize cognitive bias (Goyder et al., 2015; Schiff, et al, 2009; Singh et al., 2013). Another theme identified is the lack of disclosure from patients regarding their medical problems. The ability to conduct a complete health history and physical examination of the patient provides clinicians with reliable medical information that enables them to determine the appropriate diagnostic tests to order (Muhler, 2014). Failure to communicate between provider and patient creates conditions that lead providers to ask the wrong or limited questions during the history, and physical examination process can also contribute to failure to diagnose. Further, providers often struggle with processing clinical information when perplexing or difficult cases are encountered and often fail to perform a detailed reflective process such as that outlined by the Reflective Practice Model. The willingness of clinicians to incorporate reflection

into their daily practice is essential because the practice has been shown to facilitate the gathering of a more detailed medical history and physical examination (Mamede et al., 2013).

A diagnostic study is an important tool that providers utilize when evaluating patient's complaints because it assists them in confirming medical conditions. The appropriate diagnostic study alone or a combination with a thorough medical history and complete physical examination increases diagnostic accuracy by 90% (Paley et al., 2011). Other research has also confirmed the importance of diagnostic studies in increasing overall diagnostic accuracy (Muhler, 2014; Paley et al., 2011; Singh et al., 2013). Failure to order diagnostic studies occurs 57.4% of the time during patient-provider encounters (Singh et al., 2013). The lack of knowledge due to the failure to recognize the "worse-case scenarios" and the warning signs presented by patients can by itself contribute to failure to order diagnostic studies. Also, the failure to follow-up with diagnostic testing has been shown to account for 10% of all diagnostic errors (Sarkar et al., 2012). Lastly, unwillingness or lack of focused reflection has been shown to be a contributing factor to failure to order the diagnostic studies (Balla et al., 2012; Mamede et al., 2013; Hess, Lipner, Thomson, Holmboe, & Graber, 2015).

When a patient presents with a symptom such as chest pain, the provider will consider other common medical problems that present with chest pain, ultimately formulating a list of differential diagnoses. Formulating the differential diagnosis is the process of discerning one medical condition from another that is similar (Rhoads & Jensen, 2015). Once the list of differential diagnoses is established, providers further delineate and narrow down the differential diagnoses based on the results of the medical

history, physical examination, and diagnostic studies. Failure to go through the process of elimination through the use of differential diagnosis leads to the breakdown in the diagnostic process. One study identified that 81.1% of diagnostic errors were due to a failure to consider the differential diagnosis (Singh et al., 2013). Another study identified that the breakdown in patient encounters included the failure to consider differential diagnosis by not looking beyond the obvious and not being alert to the atypical clinical presentations (Balla et al., 2012).

Another area of concern that leads to FTD MEs is when clinicians disregard their "gut feelings" or their "sixth sense" (Balla et al., 2012). Often when providers listen to their "gut feelings" and face the uncertainties, they may be able to obtain additional information that may prompt additional evaluation and potentially another differential diagnosis (Balla et al., 2012). The top three commonly missed diagnoses are pulmonary embolism, drug reaction, and lung cancer. These medical conditions accounted for the top 13% of FTD MEs of which, 14% of primary care physicians indicated that they should have considered as part of their differential diagnosis (Balla et al., 2012; Goyder et al., 2015; Schiff et al., 2009).

Providers sometimes make clinical decisions based on cognitive biases and may be unaware of them. Cognitive bias is a mistake in clinical reasoning and is often associated with one's beliefs or philosophy with the exclusion of other evidence, resulting in a systematic judgment error (Croskerry, Singhal, & Mamede, 2013; Graber et al., 2012). Although clinicians may not be aware of it; every provider has at least one cognitive bias (Saposnik, Redelmeir, Ruff, & Tobler, 2016). Clinical diagnoses are formulated based on two types of decisions: intuitive and analytical. Intuitive decision-

making processes occur naturally, easily, and usually, do not require thinking, but may not be reliable, especially during complex clinical presentations (Croskerry et al., 2013; Mamede et al., 2008). The analytical decision-making process is more deliberate, slower, and usually involves self-reflection (Lambe, O'Reilly, Kelly, & Curristan, 2016). Unlike analytical decision-making process, intuitive decision-making processes are usually associated with cognitive biases. Within the field of psychology, a commonly held belief, verified through study, indicates that 95% of decision-making processes occur during the intuitive phase (Lakoff & Johnson, 1999). Although there are over one hundred identified cognitive biases, there are approximately 30 that commonly influence clinical decision-making (Croskerry, 2003). Studies have shown that the flaw in the intuitive decision-making process due to failure to recognize cognitive biases has contributed to 32% of diagnostic related MEs (Goyder et al., 2015; Mamede et al., 2014; Saposnik et al., 2016; Sarkar et al., 2012).

The three most common biases associated with intuitive decision-making processes that are associated with errors are anchoring, premature closer, and availability (Saposnik et al., 2016, Croskerry, 2003). Anchoring bias occurs when the clinician fixates on information obtained in the early encounter and weighs clinical decisions more significantly on the earlier information than the information obtained later during the encounter. Premature closure occurs when the practitioner fails to consider a logical, reasonable alternative diagnosis after the initial diagnosis is made. Anchoring and premature closure often occur together. The availability bias is the tendency for the clinician to consider the diagnoses when it is readily available in the provider's mind. These cognitive biases, among others, can misdirect diagnostic reasoning and lead to

MEs. Mitigating cognitive bias related to MEs through reflective practice by focusing on analytical reasoning when formulating clinical decisions, especially during complex cases, is a viable solution.

## Development of an Evidence-Based Practice Guideline

Through a comprehensive literature review, three key solutions were identified as processes that may reduce FTD MEs: 1) reflective practice, 2) use of standardized checklists, and 3) intensive collaboration with the diagnostic team which includes patients, patients' family, and allied health professionals (Mamede & Schmidt, 2004; Ely et al. 2012; Graber et al., 2017; IOM, 2015). The following section provides a review of these processes.

### Reflective Practices

Reflection is purposeful, focused, and deliberate thinking in an attempt to understand the experience and contemplate ways to improve from an event (Caldwell & Grobel, 2013; Osterman & Kottkamp, 1993). Reflective practice enables providers, such as NPs, to think critically. As a result, it enhances their ability to provide care to patients with the goal of improving the field of nursing practice. Reflection is a skill, and it is an extension of a reflective practice that allows providers to examine themselves, explore feelings, evaluate values, and learn from experiences (Bulman, Lathlean, & Gobbi, 2012; Osterman & Kottkamp, 1993). Reflective practice is the act of engaging in reflection. Reflective practice is an important component of the nursing curriculum because it enhances self-awareness, critical thinking skills, and fosters quality patient care (Benner, Sutphen, Leonard, & Day, 2010).

Thoughtful reflection consists of developing meaningful conclusions and interventions that assist in planning for future care of a patient (Barbour, 2013; Glaze, 2001). Reflection may result in positive outcomes and identify weak areas of practice that may need improvement or change (John, 2017). Advanced nursing practice students who engage in reflection often describe themselves as being more aware, open, confident, and experience more admiration of the nursing profession (Glaze, 2001). Reflection is a deliberate mental activity. It can enable healthcare practitioners to critically think, feel, and imagine while learning from an event. Reflection facilitates consideration of what might have happened if things were done differently or how things could be in the future (Asselin, 2011). Reflection is a skill that allows for the evaluation of knowledge, skills, values, beliefs, and experiences, which leads to and enhances self-awareness (Durgahee, 1997).

**Self-awareness and reflective practice.** Self-awareness is an essential component of effective reflective practice. A meaningful and productive reflection involves a provider who is willing to be open to deliberately reflect and be honest about their inner thoughts, feelings, and values they hold for themselves (John, 1995; Dube & Ducharme, 2015). Knowing who you are as a person is essential for the provider to improve and deliver high-quality patient care. Studies have shown that providers who participate in reflective practice regularly gain a heightened understanding of their thought, feelings, values, and behaviors (Benner et al. 2010; Nicol & Dosser, 2016). This, in turn, helps them provide better patient care. Advanced nursing practice students report reflection had a positive impact and described their experience as liberating, gave them more confidence in themselves, increased self-awareness, and increased

appreciation for the nursing profession (Glaze, 2001). Overall, reflective practice when engaged correctly can be a valuable professional and self-learning tool for nurses.

**Barriers to reflective practice**. Adequate time is needed for NPs to engage and benefit from reflection fully. Time constraints were noted as a barrier to reflective practice in various studies (Chong, 2009; O'Donovan, 2006). Other barriers to reflective practice were: the perception that reflection was difficult, reluctance to be honest, being uncomfortable sharing personal thoughts, values or experience, unwillingness to engage in self-assessment, and reluctance to see the benefits of positive reflection. Another barrier to reflective practice is the belief that nurses perception that they have limited power to implement changes (Mantzoukas & Jasper, 2004). Ultimately, the reflective practice can have a positive impact on the field of nursing (Chong, 2009; O'Donovan, 2006; Ip et al., 2012). Identifying the barriers to reflective practice will help the provider evaluate solutions for overcoming these obstacles and promoting professional development.

**Checklists**

The implementation of checklists started in 1935 after the crash of a Boeing B-17. A checklist was designed to ensure proper safety protocols were followed (Malouf-Todaro, Barker, Jupiter, Tipton, & Peace, 2013). The crash of the Boeing B-17 was due to overtasking of the pilots (Meilinger, 2004). Similar to pilots, healthcare providers are overwhelmed with many protocols, guidelines, procedures, and tasks that are integrated into their daily practice. It is almost impossible to remember everything. Thus, healthcare providers could benefit from using checklists to ensure all safety procedures are followed.

A checklist is a tool designed to ensure that guidelines, medical protocols, and procedures are being followed as planned, by systematically checking to make sure that important steps have been followed. Studies show that the utilization of checklists has been effective as a tool to improving adherence to guidelines, increasing compliance, reducing hospitalization, and decreasing mortality and morbidity (Kwok et al., 2013; Patel, 2014; Thomassen, Storesund, Sofetland, & Brattebo, 2014). Checklists prompt providers to identify relevant findings while considering all potential diseases or possibilities (Ely et al., 2011; Kostopoulou et al., 2015). These checklists are useful tools because they assist with decision making, re-evaluation in identifying potential MEs, and formulation of the correct diagnosis. The following section provides a review of the purpose of checklists, their role, and the most common diagnostic checklists for improving diagnostic accuracy.

**General and specific checklists.** General checklists encompass a comprehensive overview for obtaining a medical history, serve to guide in performing a thorough and focused exam, formulating a differential diagnosis, and pausing to reflect (Ely et al., 2011; Graber et al., 2014). Specific checklists focus the provider on the chief medical complaints, decrease the possibility of overlooking danger signs and "red flags," prioritize differential diagnoses, and rule out the "worst case scenario" early in the diagnostic process. Use of general checklist (See Appendix C) and specific checklists (see Appendix D) could increase diagnostic accuracy because they encourage providers to analyze thoroughly, critically evaluate, and consider all possibilities that they would not have considered (Ely et al., 2011; Graber et al., 2014).

In one study, after evaluating and verifying a diagnosis with the use of a checklist, the diagnostic accuracy increased from 46% to 51% (Sibbald, de Bruin, Cavalcanti, & van Merrienoer, 2013). Using a checklist during the verification stage of the diagnostic process increased the diagnostic accuracy, it did not increase cognitive load (Sibbald et al., 2013). The evidences in these studies indicate that the use of a checklist did not create a mental or distraction burden.

**Differential diagnosis checklist.** Differential diagnosis checklists (see Appendix E) consist of a comprehensive list of potential medical diagnosis for common complaints. The checklist can assist providers in considering all potential possibilities. Studies show that differential diagnosis checklists increase diagnostic accuracy for complex cases because providers can use analytical reasoning processes to solve clinical presentations (Rumayyan et al., 2018; Simizu et al., 2013). However, some studies have shown that differential diagnosis checklists are not as helpful when the medical case is simple and uncomplicated (Mamede et al., 2008; Simizu et al., 2013). Although few studies indicated that checklists were not helpful, checklists have not been found to be harmful (Ely & Graber, 2015; Thomassen et al., 2014; Urbach, Govindarajan, Saskin, Wilton, & Baxter, 2014). The author has been given permission to adapt and use the general checklist, specific checklist, and differential diagnosis checklist developed by specific subject matter experts in the field of diagnostic process (see Appendix F)

**Cognitive bias checklist**. Everyone makes decisions based on biases every day and it becomes second nature. Decision making is an action that is often done without thinking (Al Qahtani et al., 2016; Croskerry et al., 2013). However, making decisions based on a cognitive bias becomes a problem when the decisions that the provider make

subsequently lead to MEs (Croskerry et al., 2013; Saposnik et al., 2016). A cognitive bias checklist helps providers to step back, think, and ask questions, such as "did I base the diagnosis on any cognitive bias?" or "did I consider the diagnosis too early and possibly have committed premature closure bias?" (Croskerry et al., 2013; Ely et al. 2011; Saposnik et al., 2016). These are important questions that providers should consider when utilizing the cognitive bias checklist (See Appendix G). It is important for providers to be cognizant that biases can interfere with the diagnostic process. Cognitive bias such as over confidence, anchoring, and availability biases are connected with diagnostic errors or substandard evaluation and treatments (Saposnik et al., 2016).

Cognitive biases have been associated with diagnostic errors up to 77% of case scenarios. Furthermore, cognitive biases have been found to interfere with the gathering and synthesizing of information during the patient/provider encounter phase because they can compromise the clinical reasoning process during the diagnostic phase of care (Croskerry et al., 2013; Saposnik et al., 2016). A provider's failure to recognize cognitive bias has been linked to the breakdown in the diagnostic process, which has accounted for approximately 32% of medical malpractice claims (Goyder et al., 2015; Mamede et al., 2014; Saposnik et al., 2016; Sarkar et al., 2012). Hence, being aware of cognitive bias during the diagnostic process is an important strategy to mitigate the possibility of FTD ME. The author has been given permission to adapt and use the cognitive bias checklist (See Appendix H)

**Safer dx instrument.** The Safer Dx Instrument (see Appendix I) is another diagnostic checklist tool that is utilized to assess the absence or presence of diagnostic errors. The instrument has been tested for its validity and reliability and has been shown

to have a specificity of 90%, the sensitivity of 71%, with an overall accuracy of 84% (Al-Mutairi et al., 2016). This checklist is recognized as a multi-faceted tool to ensure that all aspects of the diagnostic process are thoroughly evaluated, including history taking, physical examination, diagnostic studies, and formulating a differential diagnosis.

Diagnostic checklists are not a complete clinical guideline; they serve as a reminder for providers to pause, reflect, and focus on areas where providers are prone to engage in cognitive biases (Ely et al., 2011; Graber et al., 2014). Using checklists consistently then sharing and reviewing the checklists with patients may maximize their benefits. When sharing, patients may contribute additional information to providers to consider while they develop all potential possibilities or differential diagnoses (Ely et al. 2011; Graber et al., 2014). The Safer Dx Instrument will be used in the current project and permission for utilization and adaptation was granted by the original researcher (see Appendix J).

**Benefits of Checklists within Multiple Healthcare Settings**

Checklists have been used extensively in operating rooms and surgical departments to promote patient safety. Implementation of the Surgical Safety Checklist and other types of checklists that focus on specific tasks or procedures, such as administration of prophylactic antibiotics during the pre-anesthesia period, and accounting for all surgical equipments and instruments post-surgery have statistically shown to decrease infection rates (Kwok et al., 2013; Rodrigo-Rincon et al., 2015). In the Intensive Care Unit, the Quality Rounds Checklist has been associated with a decrease in ventilator-associated pneumonia in the hospital from 8.74% to 1.66%

(Teixerira et al., 2013). All of these improvements were attributed to the utilization of checklists that ensure compliance with necessary procedures.

The Care Management Checklist is another example of a disease management tool that has reduced costs and improved care outcomes (Mendu et al., 2014). This checklist helps patients with seizures follow the guidelines for determining when to see a neurologist and obtains answers to questions post hospital discharge. One-year post implementation of the care management checklist, seizure patients who experienced frequent visits and hospitalization had a reduction in emergency room visits and unplanned hospitalizations from 76% to 90%, resulting in a reduction in cost to the hospital of $188,130 (Patel, 2014). The care management checklist included the implementation of an evidence-based seizure educational guideline. This combination of an evidence-based educational guideline along with a checklist led to the achievement of decreased costs and improved quality of care outcomes for seizure patients.

Regardless of the practice setting, use of checklists has shown to help all levels of provider experience. For novice providers and experts, checklists enable them to focus on key relevant data resulting in better data synthesis and generation of the correct hypothesis with fewer diagnostic errors (Sibbald, de Bruin, & Merrienboer, 2013).

**Diagnostic Team**

The NP as a provider of healthcare is also a diagnostician. As such, they should not function in isolation. The NP needs to establish a 'diagnostic team' and collaborate with them to maximize and enhance the diagnostic process (Gleason et al., 2017; IOM, 2015). The diagnostic team main role should include the collaboration with all allied health care professionals. Additionally, other important team members are the patients

and the patients' families as they will provide the pertinent information to assist in forming the correct diagnosis (Hoades and Jenson, 2015; IOM, 2015). As part of collaborating with the diagnostic team, it is essential for the NP to consider the following strategies: 1) routinely consult with supervisory physicians, especially in complex cases, 2) consult with other NPs, PAs, pharmacists, and other specialists to assist in the diagnostic process, 3) refer patients to appropriate specialist for the cases that are outside the scope of the NPs knowledge or specialty, and 4) work closely with front line staffs to coordinate all necessary process needed to enhance diagnostic accuracy (Gleason et al., 2017; Graber et al., 2017; IOM, 2015).

## Summary of Literature Review

Many studies prioritized diagnosis-related MEs in primary care settings as a significant problem and recommended educational programs to bring awareness and integrate preventive measures. Contributing factors to FTD, as a significant ME, were found to be related to a breakdown in diagnostic processes. The breakdown occurs when the providers fail to perform the following diagnostic steps: gather/complete medical history, perform a medical examination, order appropriate tests, contemplate a differential diagnosis and recognize cognitive bias. Any mistake or breakdown with the diagnostic process could lead to a FTD ME. Studies identified in this review have found the common contributing factors leading to FTD MEs that occur during the patient-provider clinical encounter phase involve data gathering and synthesis of information. Essentially, FTD occurs when NPs fail to follow the standard of care. The strategies recommended in the literature to combat medical errors are designed to decrease the diagnostic breakdown, recognize the common causes (recurrent themes) and then

integrate reflective practice and diagnostic checklists into a daily diagnostic routine to prevent these errors.

# METHODS

This QI project used a descriptive, non-experimental design. The project was designed to develop and produce an evidence-based practice educational guideline that includes an algorithm for decision making and the use of diagnostic checklists. The educational guideline is aimed to increase awareness of FTD as a significant ME impacting NP's practice. The integration of a diagnostic checklist and the utilization of reflective practice are best practices for increasing diagnostic accuracy.

## Sample and Setting

Recruitment of participants was conducted through a convenience sample from the California Association of Nurse Practitioners (CANP) members. The primary author obtained a list of members from the main office of CANP. All chapter members from the local regions that the author was affiliated with (Inland Empire and San Diego) were invited via email (see Appendix K) to attend the educational program that was delivered at a pre-determined date and time. The email described the educational program and the target population. The target populations were NPs working in the adult/family primary care, geriatric, and other internal outpatient settings. However, any NPs, regardless of specialty, were welcomed to attend but were not included in the analysis for the project.

According to the chapter presidents, the Inland Empire Chapter had approximately 200 NP members, and the San Diego Central Chapter had approximately 180 NP members. One educational program was planned for the San Diego Central Chapter. Two educational programs were planned for the Inland Empire Chapter. A continued educational unit (CEU) was offered to both chapters; however, only the San Diego Central Chapter elected to offer the CEU. One CEU was approved (See Appendix L) for the San Diego Central Chapter for attendees, regardless of their participation in the

QI project. Although both chapters had more than 380 NP members, the exact number of NPs working in the adult/family primary care, or internal outpatient settings was unknown since NPs changed their practice setting and may or may not have updated their status with CANP offices. Thus, the number of NPs who could potentially have participated in the project was unknown. The incentives for NPs to attend the educational program included receiving one CEU, a meal, and a registration fee of five to ten dollars which is in accordance with the chapter's fee rate guidelines. The program was held in the evening at three different locations; thereby providing NPs several options to select from for their added convenience.

## Instruments

Four instruments were utilized for this quality improvement project, and they were as follows: Demographic Survey, Practice Setting Survey, C-Scale Assessment, and ORIC Assessment. The Demographic Survey was used to identify the professional composition of the types of NPs participating in the project. The Practice Setting Survey was utilized to assess the practice type and resources. Next, the C-Scale was used to assess the confidence or knowledge transfer associated with the delivery of an educational program. The C-Scale was a valid, reliable tool, frequently used in educational research to appraise the efficiency of an educational process (Grundy, 1993). The C-Scale questions were reliable for testing factual recall, comprehension, critical thinking and applied knowledge in a variety of educational environments. Finally, the ORIC assessment was used to measure the participant's readiness or intent to change their practice based on the knowledge gained from the educational program. The ORIC was a readiness for change scale that was developed and validated by Shea, Jacobs, Esserman

Bruce, and Weiner (2014). ORIC was found to be reliable for evaluating the participant's intent to change their professional practice. The C-Scale and ORIC assessments were used to examine the knowledge gain by assessing the NPs confidence level related to the newly developed Integrated Diagnostic Practice Guideline (IDPG). The operational definitions are located in Appendix P.

**Demographics Survey**

The professional composition of the Demographic Survey (see Appendix Q) consists of seven questions. It was administered to all participants to collect background information about the NPs professional characteristics, including the type of specialty practiced; the highest degree obtained, age, gender, and years in practice. This information helped to delineate the relationship between specific demographics and practice related variables to the knowledge and intent to change practice post-assessment. These questions helped to assess the influence of knowledge and ability of the participant to diagnose accurately (Balla et al., 2012; Leigh & Flynn, 2017).

**Practice Setting Survey**

The Practice Setting Survey (see Appendix R) consisted of ten questions. It was administered pre-education to assess the different practice settings of the NPs and it was used to help further delineate the primary care setting from all other settings. Although data was analyzed across all NP settings, the adult/primary care practice setting represents the highest risk area for FTD according to the literature. The survey also included the gathering of information regarding practice resources, history of reflective practice and the participant's willingness to apply reflective practice and use of checklists.

These questions helped identify the factors that may contribute to FTD MEs and helped to analyze the degree of change after participation in the program.

**Confidence-Scale Assessment**

The C-Scale was a five-item questionnaire, which is frequently used in educational research to evaluate the effectiveness of an educational program (See Appendix S). This scale was given pre and post education. The C-Scale questions used a one to five point Likert scale. In this QI project, it was used to assess knowledge transfer by measuring the confidence level of the performance or application of the IDPG in daily NP practice.

**Readiness to Implement Change Practice Assessment**

The ORIC assessment consisted of 10 items (See Appendix T). This tool was used to assess the intent to change practice post education by NPs, specifically the intent to implement the IDPG. The IDPG consisted of guiding the NPs through the diagnostic process, diagnostic checklists, Safer Dx Instrument, the Reflective Practice Model and emphasized the importance of awareness of cognitive bias in the NP's practice. Studies demonstrated that participants who express that they are willing to use the skills taught in the education are more likely to perform those skills in their actual work setting (Hirt & Sherman, 1985; Ross, Lepper, & Steinmetz, 1977; Woods, Conner, Sandberg, Godin, & Sheeran, 2014). Additionally, there is a correlation between individuals who make the statement of their intention to change and their actual implementation of the change, the intention to change increased when there is a recall of memory of expected change (Woods et al., 2014). The ORIC assessment will assist in the understanding of the relationship between NPs confidence gained, the intent to implement change, and the potential of the actual application of the IDPG into their daily practice.

## Educational Program and Guideline Development

The IDPG with the Reflective Practice Algorithm (see Appendix U) was based upon the findings obtained through a review of the literature, peer-reviewed books on practice guidelines, and content experts' recommendations. Dr. Mark Graber (see Appendix V) and Dr. John Ely (see Appendix W) served as content experts. Books on evidence-based clinical practice guidelines among adult, primary care, and internal medicine were reviewed and critically appraised for their content related to history and physical examination, diagnostic testing, differential diagnosis, reflective practice, and cognitive biases. The guideline focused on the role of the Adult/Primary Care NPs to enhance their diagnostic accuracy and supported the incorporation of additional diagnostic team members where applicable in the evaluation process.

## Implementation and Data Collection

The educational program developed by the author provided an evidence-based practice decision-making guideline with an integrated diagnostic checklist using reflective practice procedures for adult/family primary care NPs working in the primary care outpatient settings. Face-to-face, 50-minute educational program sessions were conducted in a conference room at the CANP meeting sites. Due to time conflicts, the San Diego Central training meeting was canceled. All three training meetings took place at the Inland Empire Chapter meeting sites. Immediately before the program was held, participants were asked to sign a consent to participate in the project. The consent (see Appendix M) included a description of the project, how the anonymity of the participant was maintained, assessments used, and how data will be collected and stored. Before the start of the program, the participants completed the pre-assessment, which consist of the

Demographic Survey, Practice Setting Survey, and the C-Scale. Following the program, the post- assessments were provided, which included the C-Scale and ORIC assessment. Permission has been granted from the researchers to adapt and use the C-Scale assessment (see Appendix N) and ORIC assessment (see Appendix O).

Before the educational program, participants had placed their completed pre-assessments inside an envelope labeled PRE-TEST. After the program, the post-assessments were placed in the envelope marked POST-TEST. All instruments were distributed and collected by the primary author and data remained in the author's possession in all times in a password protected computer.

## Ethical Considerations

Before the educational program was offered, the project was submitted to the Institutional Review Board (IRB) of California State University, Los Angeles (CSULA) for approval. Since this was a QI project and human subjects were participating in the education, IRB approval was necessary to ensure the project was adhering to ethical standards and practices. However, due to the nature of the project, it was granted exempt status from the CSULA's IRB. See Appendix X for exemption letter. The data used for the project was de-identified and stored in a locked cabinet and a password-protected computer that only the primary author had access to. Approval letters from the CANP Inland Empire Chapter (see Appendix Y) and the CANP San Diego Central Chapter (see Appendix Z) were obtained to conduct the educational program. Letter of support from the author's employment expressing the support for the IDPG to be conducted at the CANP chapters are attached in Appendix AA. Table 1 outlined the timeline used as a guideline to implement the project.

Table 1

*Timeline*

| August 2018 | September 2018; October 2018 | November 2018; December 2018 | December 2018 | January 2019 | January 2019 |
|---|---|---|---|---|---|
| Applied for CSULA IRB approval.<br>Developed educational guideline | Created Educational In-service PowerPoint<br><br>Obtained CANP (both chapters) & sent Emails Invite/Recruit NP members | Presented PowerPoint Educational in-service to Inland Empire Chapter on November 14 (Northern) and November 15 (Southern) | Confirmed who will help with data analysis;<br>Created data tables showing baseline, partial implementation, and current outcomes | Wrote up analysis of data; put proposal in past tense; | Wrote full doctoral project paper; submit hours log |
| Presented IDPG to experts for review/suggestions (Dr. Mark Graber and Dr. John Ely) | TL reviewed PP content and tools (Demographic/Practice Setting Assessments, C-Scale, and ORIC). | Provided Educational in-service to Inland Empire<br><br>Identified who will help with data analysis | NP participants<br>Data analysis, recheck metrics and evaluated guideline adherence | Wrote abstracts to submit to conferences CANP: The American Association of Nurse Attorneys | Submitted abstracts to conferences |
| January 2019 | February 2019 | March 2019 | April 2019 | May/June 2019 | June 2019 |
| Completed paper to submit to TL | Made revisions to paper-based upon TL/TM f | Finalized paper to meet committee approval/poster. | Presentation at Dissemination Day | Completed clinical hours log Graduation! | Submit manuscript to nursing journal |

## Data Analysis

The following analyses were conducted: (1) pre and post-education survey using the C-scale results for analysis and (2) post-education survey using the ORIC assessment results for intent to change practice. Demographic data of the sample and practice setting data were measured using descriptive statistics such as frequency counts and means. The demographic and practice setting data included the following examples: (1) type of specialty practice, (2) practice site such as out-patient or in-patient setting, and (3) amount of education. A *t*-test was used to compare the mean scores between pre and post-education test results from the C-Scale assessments to determine if there was a significant difference in knowledge transfer. Finally, the ORIC assessment was used to determine the NP participant's intention to change practice after participating in educational training. A post-education correlational analysis was conducted between the post C-Scale and the post ORIC results to determine if there was a relationship between knowledge gained and intent to change practice. Descriptive statistics such as frequency counts and means were used to assess the population and sample data. A *t*-test was used to examine if there was a significant difference between the means for intent to change practice and confidence level. The variables, measurement, and statistical analysis that were used to analyze the data are shown in Table 2.

Data were examined for missing values. There were no missing values. The scores were summarized to ascertain and define the confidence level and the intent to change. The descriptive statistics and paired *t*-tests were conducted using IBM Statistical Package for Social Science (SPSS) Version 25.0 software.

## Data Collection

For NPs' convenience, three training sessions were offered for the members of the CANP Inland Empire. In the first training session, 27 NPs participated in the training; however, only 17 NPs completed the pre and post surveys. In the second training session, 24 NPs attended, and 13 NPs completed the pre and post surveys. In the third training session, 20 NPs attended the training, and four NPs completed the pre and post surveys. Overall, out of 34 out of 71 (48%) of NPs who attended the three training meetings completed the pre and post-intervention assessments. Participants completed the Demographic Survey, Practice Setting Survey, and C-Scale Survey before face-to-face training meeting and immediately after completed the post-C-Scale Survey and ORIC survey.

Table 2

*Variables, Levels of Measurement, and Statistical Analyses*

| Variable | Level of measurement | Statistical analysis |
|---|---|---|
| Gender | Nominal | Mean (*SD*), Frequency, & Percentage |
| Age | Nominal | Mean (*SD*), Frequency, & Percentage |
| Ethnicity | Nominal | Frequency & Percentage |
| Highest Degree | Ordinal | Frequency, & Percentage |
| Years Practice as NP | Ordinal | Frequency, & Percentage |
| Employment Status | Nominal | Frequency, & Percentage |
| Certification Specialty | Nominal | Frequency, & Percentage |
| Specialty Currently Working | Nominal | Frequency, & Percentage |
| Practice Setting | Nominal | Mean (*SD*), Frequency, & Percentage |
| Other Specialty Worked | Nominal | Mean (*SD*), Frequency, & Percentage |
| Reason Switching Specialty | Nominal | Mean (*SD*), Frequency, & Percentage |
| Feel Rushed | Nominal | Mean (*SD*), Frequency, & Percentage |
| Regularly Practice Reflection | Nominal | Mean (*SD*), Frequency, & Percentage |
| Strategies to Reduce DE | Nominal | Mean (*SD*), Frequency, & Percentage |
| Using Checklist | Nominal | Mean (*SD*), Frequency, & Percentage |
| Using Safer Dx Instrument | Nominal | Mean (*SD*), Frequency, & Percentage |
| Open to EBP Guideline | Nominal | Mean (*SD*), Frequency, & Percentage |
| Past Claim | Nominal | Mean (*SD*), Frequency, & Percentage |
| Patient Age Distribution | Ordinal | Mean (*SD*), Frequency, & Percentage |
| NP Confidence/Intent Change | Ordinal | Mean (*SD*). Pre-test & Post-test paired *t*-test. Correlation. |
| NP Intent to Change | Ordinal | Mean (*SD*), Frequency, & Percentage. |

# RESULTS

The purpose of this QI project was to develop, train, and evaluate the confidence level and the intent to change or the willingness of NPs to implement IDPG in their practice. The results of the demographic and practice setting characteristics, confidence level, and the intent to change are discussed as follows.

## Demographic and Practice Settings

The descriptive statistical analysis of the demographic survey of the participants indicated that most of the participants were female (85.3%, n = 29) with an average age range of 35 to 75 years old. They were a mixture of ethnic groups with the majority being Asian/Pacific Islander. The participants mostly held a Master of Science Degree with an average range between one to twenty years of experience as an NP. Majority of the participants were certified as family NP and worked as Family NP. The descriptive statistical analysis of the practice settings showed that the participants worked in various outpatient settings; however, most of NPs, (55.9%), worked in outpatient clinics and 20.6% of NPs worked in primary care clinic. Although all the participants practiced as Family NP, they had various past experiences in other specialties such as women's health and urgent care. Few of the NPs, 35.5%, have worked in multiple specialties. There were 29.4% of the NPs indicated that the high patient load, with the high complexity of patient care, and a lack of administrative support as the reasons for leaving their primary care specialty. Majority of NPs, (70.6%), felt rushed while seeing patients.

It was determined that 76.5% of NPs regularly practice reflection, 26 NPs out of 34. Out of the 34 NPs, 27 (79.4%) of them indicated that they regularly integrate strategies to reduce diagnostic errors. Most NPs (61.8%) indicated that they do not use a

checklist while examining and evaluating patients; 21 out of 34. The majority of NPs (91.2%), 31 out of 34 reported that they do not use Safer Dx Instrument to verify the accuracy or inaccuracy of their diagnosis. Also, a majority of NPs (94.1%), 32 out of 34 were opened to the implementation of an evidence-based practice guideline. One NP reported having had one medical malpractice lawsuit claim, one NP was unsure, and two NPs preferred not to answer. Table 3 summarizes the demographic characteristics and Table 4 summarizes the practice setting of the participants.

## Confidence Level Assessment

The C-Scale Survey consisted of five questions using a 5-point Likert. The scores between 1-15 were clustered and defined as "less certain," and the scores between 16-25 were defined as "most certain." Also, the paired samples *t*-tests compared the means of the pre-test C-Scale and the post-test C-Scale to assess the confidence level pre and post-training. The results of all five questions of pre-training C-Scale received the score between 1-15, indicating "less certain" about the confidence level of IDPG.

Alternately, the post-training C-Scale questions received scores of 16-25, indicating "most certain." The score of "most certain" across all the five questions illustrated an increase in the confidence level or knowledge of the IDPG post-training. The pre-training C-Scale and post-training C-Scale of the paired sample *t*-tests revealed a statistically significant difference across all five questions of the C-scale between the pre- and post-training (Table 5). The results indicated that the participants believed their knowledge or confidence increased as a result of the education.

Table 3

*Demographic Characteristics of the CANP Inland Empire NPs*

| Variables | *M* (*SD*) | Frequency (Valid %) |
|---|---|---|
| Gender | 1.15 (.359) | |
| Female | | 29 (85.3) |
| Male | | 5 (14.7) |
| Age | 3.74 (1.163) | |
| 18-24 | | 1 (2.9) |
| 25-34 | | 4 (11.8) |
| 35-44 | | 9 (26.5) |
| 45-64 | | 10 (29.4) |
| 65-74 | | 9 (26.5) |
| 75 + | | 1 (2.9) |
| Ethnicity | 3.18 (1.732) | |
| Caucasian | | 10 (29.4) |
| Hispanic/Latino | | 3 (8.8) |
| African American | | 6 (17.6) |
| Native American | | 1 (2.9) |
| Asian | | 14 (41.2) |
| Highest Degree | 2.79 (.479) | |
| Ph. D | | 1 (2.9) |
| DNP | | 5 (14.7) |
| MSN | | 28 (82.4) |
| Years Practice As NP | 2.26 (1.333) | |
| 1-05 | | 15 (44.1) |
| 6-10 | | 5 (14.7) |
| 11-15 | | 5 (14.7) |
| 16-20 | | 8 (23.5) |
| 21-25 | | 1 (2.9) |
| Employment Status | 1.26 (.448) | |
| Full-Time | | 25 (73.5) |
| Part-Time | | 9 (26.5) |
| Certification Specialty | 2.35 (1.152) | |
| Adult NP | | 2 (5.9) |
| Family NP | | 27 (79.4) |
| Primary Care NP | | 3 (8.8) |
| Internal Medicine NP | | 1 (2.9) |
| Not Certified | | 1 (2.9) |
| Specialty Currently Working | 2.38 (.779) | |
| Adult NP | | 1 (2.9) |
| Family NP | | 24 (70.6) |
| Primary Care NP | | 4 (11.8) |
| Internal Medicine NP | | 5 (14.7) |
| Total | | 34 |

Missing data = 0

Table 4

*Practice Setting of the CANP Inland Empire NPs (*N = *34)*

| Variables | *M* (*SD*) | Frequency (Valid %) |
|---|---|---|
| Practice Setting/Outpatient Type | 2.21 (0.946) | |
| Doctor's Office | | 6 (17.6) |
| Outpatient Clinic | | 19 (55.9) |
| Primary Care Clinic | | 7 (20.6) |
| Other | | 2 (5.9) |
| Worked in Other Specialty | 6.09 (2.221) | |
| Women's Health | | 5 (14.7) |
| Urgent Care | | 6 (17.6) |
| Other | | 11 (32.4) |
| Multiple | | 12 (35.3) |
| Reason for Leaving Primary Care | 8.38 (2.243) | |
| High Patient Load | | 2 (5.9) |
| Complex Patients | | 1 (2.9) |
| Lack of Administrative Support | | 1 (2.9) |
| Other | | 8 (23.5) |
| Multiple Above | | 10 (2934) |
| Not Applicable | | 12 (35.3) |
| Feel Rushed | 1.29 (.462) | |
| Yes | | 24 (70.6) |
| No | | 10 (29.4) |
| Regularly Practice Reflection | 1.24 (.431) | |
| Yes | | 26 (76.5) |
| No | | 8 (23.5) |
| Integrate Strategies to Reduce Diagnostic Errors | 1.02 (0.410) | |
| Yes | | 27 (79.4) |
| No | | 7 (20.6) |
| Using Checklist | 1.60 (.493) | |
| Yes | | 13 (38.2) |
| No | | 21 (61.8) |
| Using Safer Dx Instrument | 1.91 (.288) | |
| Yes | | 3 (8.8) |
| No | | 31 (91.2) |
| Open Implement EBP Guideline | 1.06 (.239) | |
| Yes | | 32 (94.1) |
| No | | 2 (5.9) |
| Past Claim | 2.12 (.537) | |
| Yes | | 1 (2.9) |
| No | | 30 (88.2) |
| Not Sure | | 1 (2.9) |
| Prefer Not to Answer | | 2 (5.9) |
| Patient Age Distribution | 6.82 (.387) | |
| 41 - + | | 6 (17.6) |
| 13 - 41 + | | 28 (82.4) |

## Intent to Change Level Assessment

The intent to change or the willingness to incorporate IDPG was measured with the ORIC survey after the training, consisting of ten questions. Similar to the C-Scale results, the ORIC questions were scored, labeled, and defined to measure the level of the willingness of intent to change. The score of 1-20 indicated "no intention to change," and a score of 21-30 indicated "neutral to change," with the score of 31-40 indicating "likely to change," and a score of 41-50 indicated "highly likely to change." The post-ORIC survey resulted in scores ranging from 41-50 across the ten questions, which indicates that the participants were "highly likely to change." The analysis of the descriptive statistics of the ORIC Survey post-training revealed the mean scores were between 4.29 to 4.41 with a standard variation range of .109 to .132 across the ten questions of the ORIC post-training assessment. Also, the majority of the NPs marked "agree" and "strongly agree" in all ten elements of the ORIC, which demonstrated a high level of commitment to intent to change through future implementation of the IDPG into their practices (Table 6).

## Pre-Training and Post-Training Confidence Level

The mean total C-scale for all participants who completed the C-Scale confidence level assessment pre-training was 11.62, (SD = 5.774) and post-training was 18.59, (SD = 3.448), with t (-7.596) p = .001. The results indicated that participants who received the training had expressed an improvement in their confidence level for using the IDPG was statistically significant. Table 7 shows the statistical results of the sum of the post-C-Scale and the sum of the post-ORIC.

**Post-Training Confidence and Intent to Change Practice Correlation**

A Pearson correlation test between the sum post-training C-Scale and the sum post-training ORIC surveys revealed a statistically significant relationship between the confidence level of the participants related to knowledge of the IDPG and the intent to change practice post-training, ($r(32) = .365$, $p = .034$). The tests indicated that the higher the score on the confidence level of the IDPG the higher the scores on the intent to change. The results of the correlations indicate that the more confidence gained on the IDPG, the more likely the participants had the intention to change. Tables 5-8 on the following pages demonstrate the statistical data and results from these assessments.

# DISCUSSION

The goal of this evidence-based QI project was to implement and evaluate the educational training of the newly developed IDPG through the use of four assessments: Demographic Survey, Practice Setting Survey, C-Scale Survey, and ORIC Survey. The data gathered from this QI project provided valuable insight into the demographics and practice settings for primary care NPs, including the NP's diagnostic process on whether they practice reflection, utilize checklist or integrate strategies to reduce diagnostic errors. The results of the four surveys are discussed sequentially.

## Demographic and Practice Setting Characteristics

First, the majority of NPs reported practice as Family NPs, and most NPs reported their practice as being in outpatient settings. The female NPs were overrepresented in the sample, which restricts generalization about male NPs. There were no clinical studies noted in the literature that showed gender differences in the propensity to engage in diagnostic errors nor was there a gender difference in willingness to change (Gleason et al., 2017). The ethnic diversity of the sample was limited to 29.4 percent White, and 41.2 percent Asian. However, there was a small percentage of Hispanic NP participants represented by only 8.8%. The IOM noted the shortage of ethnically diverse providers in nursing and the IOM also indicated that the face of nursing did not reflect the patient population that they served (Gerardi, 2015). According to the United States Census Bureau (2018), California census indicates that the population consists of 72.4% White, 15.2% Asian, and 39.1% Hispanic. The result of the ethnicity question in this survey is consistent with the IOM's findings, indicating that Hispanics are under represented among healthcare providers.

Family practice clinics are often presented with overbooked schedules and with a limited amount of time to for providers to adequately evaluate patients with challenging complaints (Al-Qahtani et al., 2016; Ely et al., 2012; Lin et al., 2001). It was not surprising that the majority of NPs felt rushed while examining patients. Also, NPs indicated that the high patient load, increased in complex patients, and lack of administrative support were reasons for switching from primary care specialty to another specialty. Although it was not assessed in the Practice Setting survey, it would be beneficial to explore if NPs believed that the relationship between high patient load, increased in complex patients, and lack of administrative support were the contributing factors to high FTD ME and high medical malpractice rates among Adult / Family NPs. However, when asked about if the NP ever had medical malpractice claims filed against them due to diagnostic errors, one NP disclosed that she had one claim against her, two NPs were not sure, two NPs declined to answer, and the remaining responses were no. These findings demonstrated the difficulties associated with identifying FTD MEs when NPs are asked to disclose. Gathering data from a national data bank may have yielded the information needed to determine if the high is patient loads, the complexity of patients, and the limited time allowed to evaluate patients impact malpractice claims (Al-Qahtani et al., 2016; Dugdal et al., 1999; Lin et al., 2001; Singh et al., 2017).

**History of Medical Malpractice Claims**

Although 1 out of 34 NPs reported past medical malpractice claim, there was insufficient data to report if this finding was consistent with the percentage of claims filed against NPs (Sweeney et al., 2017). According to the NSO (2017), NPs who have been in practice longer experienced more medical malpractice claims compared to NPs

who newly entered the field. It was speculated by experts that increased in medical malpractice claims among seasoned NPs were because NPs who have been in practice longer are less likely to implement changes, may not routinely practice thorough reflection, and have fallen into the usual routine. However, this QI project's data did not find any correlations with increased claims among seasoned NPs, or any relationship of experienced NPs unwillingness to integrate new EBP into their practices.

**Implementation of Evidence-Based Practice**

There were 94% of participants that indicated that they were open to the utilization of EBP to enhance the diagnostic process. The high level of acceptance of EBP is important to note especially in light of the IOM 2020's goal that 90% of clinical decisions must be based on EBP. The finding of NPs willingness to implement EBP is consistent with many studies, which indicate that NPs are often empowered to utilize strategies determined by research to be effective since their goals are to provide safe care and to improve patient outcomes (Black, Balneaves, Garossino, Puyat, & Gian (2015); Stevens (2013); Weng et al., 2015).

Although Warren et al., (2016) indicated that younger providers exhibited more positive attitudes toward EBP and are more willing to embrace EBP when compared to older providers, the findings in this QI project did not yield any age-related difference and the willingness to integrate EBP or willingness to implement change. However, the findings were consistent with many studies that regardless of age and years of practice, the majority of NPs were open to incorporating EBP and majority of NPs exhibited an intent to implement the IDPG (Black et al., 2015; Tacia, Biskupski, Pheley, & Lehto, 2015; Weng et al., 2015).

Table 5

*Pre-Training and Post Training C-Scale Paired Samples t-Test* ($n$ = 34)

| Variables | | Mean | *SD* | 95% CI of the Difference | | *t* | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|
| | | | | Lower | Upper | | |
| Pair 1 | Certain of my performance of IDPG Pre-ED | 2.35 | 1.252 | | | | |
| | Certain of my performance of IDPG Post-ED | 3.76 | .654 | -1.859 | -.964 | -6.421 | .001 |
| Pair 2 | Feel can perform IDPG Pre-ED | 2.44 | 1.284 | | | | |
| | Feel can perform IDPG Post-ED | 3.71 | .871 | -1.714 | -.816 | -5.732 | .001 |
| Pair 3 | Convince observer of competent performance of IDPG Pre-ED | 2.29 | 1.194 | | | | |
| | Convince observer of competent performance of IDPG Post-ED | 2.56 | .894 | -1.679 | -.850 | -6.205 | .001 |
| Pair 4 | Sure of myself as perform IDPG Pre-ED | 2.24 | 1.208 | | | | |
| | Sure of myself as perform IDPG Post-ED | 3.74 | .666 | -1.877 | -1.123 | -8.098 | .001 |
| Pair 5 | Satisfied with performance of IDPG Pre-ED | 2.26 | 1.163 | | | | |
| | Satisfied with performance of IDPG Post-ED | 3.82 | .716 | -1.173 | -8.217 | -8.217 | .001 |

Table 6

*Descriptive Characteristics of Intent to Change*

| Variables | Mean (*SD)* | Frequency (Valid %) |
|---|---|---|
| Committed to implement IDPG Post ED | 4.29 (.719) | |
| Agree | | 14 (41.2) |
| Strongly Agree | | 15 (44.1) |
| Determined to implement IDPG Post ED | 4.29 (.676) | |
| Agree | | 16 (47.1) |
| Strongly Agree | | 14 (41.2) |
| Motivated to implement IDPG Post ED | 4.32 (.638) | |
| Agree | | 17 (50.0) |
| Strongly Agree | | 14 (41.2) |
| Want to implement IDPG Post ED | 4.26 (.666) | |
| Agree | | 17 (50) |
| Strongly Agree | | 13 (38.2) |
| Need to implement IDPG Post ED | 4.35 (.691) | |
| Agree | | 14 (41.2) |
| Strongly Agree | | 16 (47.1) |
| Believe IDPG benefit practice Post ED | 4.35 (.646) | |
| Agree | | 16 (47.1) |
| Strongly Agree | | 15 (44.1) |
| Believe change benefit practice Post ED | 4.29 (.646) | |
| Agree | | 16 (47.1) |
| Strongly Agree | | 14 (44.2) |
| Feel implementing IDPG good idea Post ED | 4.38 (.652) | |
| Agree | | 15 (41.1) |
| Strongly Agree | | 16 (47.1) |
| Value change of incorporating IDPG Post ED | 4.41(.657) | |
| Agree | | 14 (41.2) |
| Strongly Agree | | 17 (50) |
| Know what it takes implement IDPG Post ED | 4.32 (.768) | |
| Agree | | 14 (41.2) |
| Strongly Agree | | 16 (47.1) |

Table 7

*Sum of Pre/Post-Training C-Scale Paired Sample t-Test and Sum of Post-Training C-Scale and Sum of Post-Training ORIC Paired Sample t-Test*

| | Variables | Mean (*SD*) | 95% CI of the Differences | | *t* | Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| | | | Lower | Upper | | |
| Pair 1 | Sum of C-Scale Pre-ED | 11.62 (5.774) | | | | |
| | Sum of C-Scale Post-ED | 18.59 (3.448) | -8.838 | -5.103 | -7.596 | .001 |
| Pair 2 | Sum of C-Scale Post-ED | 18.59 (3.448) | | | | |
| | Sum of ORIC Post-ED | 43.29 (6.187) | -26.758 | -22.654 | -24.499 | .001 |

Table 8

*Correlations between Post-Training Knowledge (C-Scale) and Intent to Change (ORIC)*

| | | | 95% CI of the Difference | |
|---|---|---|---|---|
| | Variables | M (*SD*) | *r* | Sig. (2-tailed) |
| Pair 1 | Sum of Confidence of IDPG (C-Scale PostED) | 18.59 (3.448) | 1 | .034 |
| | Sum of Intent to Change (ORIC PostED) | 43.29 (6.187) | 1 | .034 |
| Pair 2 | Sum of Confidence of IDPG (C-Scale Post-ED | 18.59 (3.448) | 1 | .001 |
| | Sum of Intent to Change ORIC PostED | 43.29 (6.187) | 1 | .001 |

**Practice Reflection and Integrate Strategies to Reduce Diagnostic Errors**.

In light of the high rate of diagnostic errors among Adult/Primary Care NPs, it is surprising to note that the majority of NPs, at the level of 76.5%, indicated that they

practice reflection. However, it is not clear if the NPs practice of reflection was completed correctly since they were not asked if they routinely practiced all of the five elements of the Reflective Practice Model. Also, NPs were not asked if they practiced Type 1 or Type 2 clinical reasoning, which would have helped the author to determine the amount of cognitive bias they experienced when making medical decisions. Since experts theorized that 95% of decisions are based on Type 1 clinical reasoning, it is reasonable to assume that most NPs may not practice Type 2 reasoning (Lakoff & Johnson, 1999).

Also, the majority of NPs reported that they integrate EBP while evaluating patients, with 79.4% of NPs indicating that they integrated strategies to reduce diagnostic errors. The Practice Setting Survey did not explore further if NPs consistently incorporated the appropriate EPB to reduce FTD MEs. Although it would be important to further examine what types of strategies or if the strategies were evidence-based when the NPs indicated that they consistently implement into their practices in an attempt to enhance the diagnostic accuracy. These additional questions on if the strategies the NPs implemented were evidenced-based or not, would assist in exploring the potential contributing factors to the FTD ME rates.

**Diagnostic Checklists and Safer Dx Instrument**

The majority of NPs, 94%, do not utilize Safer Dx Instrument to verify the accuracy of their diagnoses, and 60% of NPs do not utilize diagnostic checklists to assist with the diagnostic process. Research studies show that the Adult/Family NPs often are challenged with complicated patients with multiple co-morbidities. Accordingly, it is essential for Adult/Family NPs to utilize the Safer Dx Instrument and diagnostic

checklists to assist or audit the diagnostic process to ensure a thorough medical history and physical examination were done, diagnostic studies were ordered, and differential diagnosis were appropriately formulated. The lack of the utilization of the diagnostic checklists and the Safer Dx Instrument to confirm the accuracy of the diagnostic processes by NP was surprising. Nonetheless, the NPs failure to utilize these diagnostic aides may have contributed to high rate of FTD ME among Adult/Primary Care NPs (Al-Mutairi et al., 2016; Ely et al., 2011; Ely et al., 2012). Furthermore, these results confirm the urgent need for educational training on the benefits of diagnostic checklists and utilization of Safer Dx Instrument to confirm or verify the accuracy of the diagnosis. Because diagnostic errors are so common, harmful, and challenging to detect, it is imperative to educate NPs on how to properly utilize and incorporate the Safer Dx Instrument into their routine practice (Al-Mutairi et al., 2016).

**Increase Confidence Level Post-Training**

There was a statically significant increase in confidence level after the training of IDPG ($p = .034$). An increase in confidence level scores across all the five questions post educational training was a promising finding because it reaffirmed many studies which indicated that NPs were open to EBP and they were open to strategies to improve patient care, with the goal of reducing medical errors (Black et al., 2015; Tacia 2015). This result it is an important step towards supporting the IOM's goal of reduction of medical diagnostic errors. Also, the increase in the confidence level of the training of IDPG indicated that NPs could learn strategies to assist in the reduction of FTD ME rates. The World Health Organization (WHO, 2016) emphasized that the most powerful tool to improve the diagnostic accuracy among primary care providers is through focused

training on clinical reasoning and critical thinking as strategies to reduce cognitive biases. These recommended strategies are embedded in the IDPG. Also, there is a calling for the AACN to initiate a campaign to reduce medical harms and enhance the diagnostic process by mandating that the reduction of medical diagnostic errors curriculum be taught in nursing school. The finding of this increase in confidence level post-training of the newly developed IDPG may encourage other NPs and clinic administrations to adapt it into their clinical settings. Although IOM and WHO continue to advocate strategies to enhance the diagnostic process, the recognition of the need to include the subject of diagnostic errors and its prevention in the nursing curriculum is still lacking (Leigh & Flynn, 2013; Sweeney, et al., 2017; WHO, 2016).

**Increased Confidence and Intent to Change Levels**

Evidence showed that an intention to change is a key factor in behavior change. Also, research showed that intentions are more likely to be implemented into action when respective behaviors are easier to perform. Therefore, an increase in knowledge and confidence level and the intention to change offers a realistic prediction of the changed behavior. Also, the intention to change has been shown to be the best predictor for behavior change, which suggests that behaviors are often linked with one's motivation (Sheeran, Harris, & Epton, 2014).

In this project, the NPs were presented with education on the strategies to enhance the diagnostic process and it helped shape positive attitudes towards behavior change after the knowledge or confidence level were increased post-training. Hence, the result of the Pearson correlation in this project supported this theory; the higher the confidence level the NP gained, the higher the intent to change were expressed. In other words, the

NPs confidence or possesses the ability to perform the change there should be an increase in an intention to implement the IDPG in their practice settings (Baumeister & Bargh, 2014; Sheeran, Harris, & Epton, 2014). However, although the intent to change was articulated by the NPs in this project, without continued incentives, support, or planned interventions from the administration or their prospective practice settings the change may not occur due to lack of motivations and time (Bahadori, Raadabadi, Ravangard, & Mahaki, 2016; Baumeister & Bargh, 2014; Gollwitzer, 2014; Sheeran, Harris, & Epton, 2014). Therefore, to motivate intention to change into action, it is essential that NPs have means, including support from administration to implement the IDPG within a reasonable timeline.

## CLINICAL IMPLICATIONS AND RECOMMENDATIONS

This QI project has provided important findings that NPs are ready and willing to incorporate EBPs into their clinical settings when provided with knowledge about best evidence-based practices. More importantly, the clinical implication of the finding indicates that NPs possess the ability to gain knowledge of the strategies used to reduce diagnostic errors as evidenced by their increase in confidence level as measured by the C-Scale Survey and their expressed willingness to incorporate IDPG after the educational training as measured by the ORIC survey. The diagnostic errors, including FTD ME, are a complex and multifaceted medical practice problem. There is an urgent call by the IOM and the WHO to address this medical crisis. There is no single person, organization or one strategy alone that could solve the problem; however, implementation of an IDPG that is based on evidence is one step in the right direction.

Since Adult/Primary Care NPs experienced the highest rate of diagnostic errors, especially FTD ME, it is paramount that Adult/Primary Care NPs focus on implementing proven EBP to reduce MEs. Consistent with current expert recommendations, this QI project recommends the following four main strategies to combat the FTD MEs: 1) Form a diagnostic team to assist with the diagnostic process, 2) Perform thorough individual reflective practice and refrain from making a clinical decision based on cognitive biases, 3) Utilize the diagnostic checklists, including the Safer Dx Instrument to aid and confirm the accuracy of the diagnosis, and 4) Recognize and overcome barriers to effect positive change.

The recommendations discussed above were the strategies embedded in the IDPG. The recommendations were based on a review of the literature and survey results

from Adult/Primary Care NPs. The recommendations noted within the IDPG are strategies for NPs to recognize contributing factors to diagnostic errors, the importance of utilization of Reflective Practice Model and the diagnostic checklists, and the involvement of diagnostic teams, including the patients and family members with the goal of reduction of FTD MEs.

## LIMITATIONS

The author identified several limitations in this QI project. First, is that the definition of the level of reflection was not defined in the Practice Setting Survey pre-test. The author believes that the participants may indicate that they practice reflection simply because they evaluate patients intuitively and automatically during the diagnostic process. The author suspects that if the same question was asked on whether they practice reflection during the diagnostic process post educational training after the definition of Type 1 and Type 2 clinical reasoning were defined, the answers may be different. The NPs may indicate that they regularly practice Type 1 reflection, which is based on intuitive decision making and not based on Type 2 decision making, which consisted of a slow, deep, deliberate, and analytical thinking.

The second limitation is that the majority of NPs indicated that they integrate strategies to reduce diagnostic errors; the word strategies were not defined nor clear. Although most of the NPs stated that they utilize strategies, the author still did not know what kind of strategies the NP used. Also, the strategies that the NPs had implemented in an attempt to reduce diagnostic error may or may not be evidence-based interventions to utilize. The author believes if this question was asked post-training, the answer might be fewer NPs endorsing the use of strategies. The author believes that the ideal question to ask was to have the NPs list the strategies, instead of asking a question to solicit a "yes" or "no" responses.

The third limitation was that the barriers to the implementation of a newly developed EBP were not assessed in the Practice Setting Survey. Although the majority of NPs were opened to the implementation of EBP in their clinical settings, the

identification of the barriers would give the opportunity for any administrative staffs who are interested in the integration of the IDPG into their practices the opportunity to address the barriers and to overcome.

The fourth and last major limitation identified was the small sample size. Although three educational training sessions at two different locations were offered and conducted, only 34 NPs participated in the survey of the 71 who attended. The limited amount of NPs participation created a small sample size which restricted generalization of the findings to other populations (Shifaza, Evans, & Bradley, 2014).

# CONCLUSION

Given the shortage of physicians by 2025 from 34,600 to 82,600 and the high demand for healthcare providers such as NPs to fill the gap, there is a strong need for the NP profession to enhance their diagnostic accuracy. Nurse Practitioners are the largest group of non-physician providers, of which there are estimated to be 56,000 primary care providers (Auerbach et al., 2013; Traczynski et al., 2018). Further, the NPs medical malpractice rate has steadily increased over the last 13 years, with diagnostic errors as one of the leading causes for these cases, there is a reasonable cause for concern. Educational strategies to decrease diagnostic errors, especially FTD MEs are needed. This QI project's findings were insightful as they examined the demographic and practice settings, whether the NPs engage in reflective practice, and whether they integrate strategies to reduce diagnostic errors. The surveys identified multiple challenges NPs face during the diagnostic process. The results were impactful because they provide insight into the NPs level of confidence gained from their increase in knowledge about this newly developed IDPG post educational training and their willingness to implement this IDPG with associated reflective practice as a strategy to reduce FTD ME. Lastly, the reflective practice could be further studied in future QI projects and research to gain a better understanding of the retention of knowledge gain and the actual implementation of the IDPG by the NPs clinical settings in six months and one-year post educational training.

## REFERENCES

Al-Qahtani, D. A., Rotgans, J., Mamede, S., Alalwan, I, Magzoub, M. Eldin, M., . . . , & Schmidt, H. (2016). Does time have a negative effect on diagnostic accuracy? *Academic Medicine*, 91(5), 710- 716.doi:10.1097/ACM.000000000000109

Al-Mutairi, A., Meyer, A. N. D., Thomas, E. J. Etchegaray, J., Roy K., M., Davalos, M. C., . . . , & Singh, S. (2016). Accuracy of the safer dx instrument to identify diagnostic errors in primary care. *Journal of General Internal Medicine, 31(6), 602-608*.doi:10.1007/s11606-016-3601-x

Auerbach D.I., Chen P.G., Friedberg M.W., Reid, R., Lau, C., Buerhaus, P. I., & Mehrotra, A. (2013). Nurse-managed health centers and patient-centered medical homes could mitigate expected primary care physician shortage. *Health Affairs,* 32:1933-1941. doi: 10.1377/hlthaff.2013.0596

Asselin, M. (2011). Using reflection strategies to link course knowledge to clinical practice: the RN-to-BSN student experience. *Journal of Nursing Education*, *50*(3), 125-133.doi:10.39280/148434-20101230-08

Bahadori, M., Raadabadi, M., Ravangard, R. & Mahaki, B. (2016). The barriers to the application of the research findings from the nurses' perspective: a case study in a teaching hosptital. *Journal Education Health Promotion, (5)*14. doi: 10.4103/2277-9531.184553

Balla, J. Heneghan, C., Goyder, C., & Thompson, M., (2012). Identifying early warning signs for diagnostic errors in primary care: a qualitative study. *British Medical Journal Open Accessible Medical Research*. doi:10.1136/bmjopen-2012-001539

Barbour, F. (2013). The making of a butterfly: reflective practice in nursing education. *International Journal for Human Caring*, 17(3), 1-11. Phoenixville, Pennsylvania: Association for Human Caring, Inc. ISN: 1091-5710

Baumeister, R. F. & Bargh, J. A., (2014). Conscious and unconscious: toward an integrative understanding of human mental life and action. In J. W. Sherman, Gawronski, & Y. Trope (Eds,), *Dual-process theories of the social mind*. New York, NY, US: Gilford Press.

Benner, P. Sutphen, M. Leonard, V. & Day, L. (2010). *Educating nurses: a call for radical transformation.* San Francisco, CA: Jossey-Bass. ISBN: 978-0-470-45796-2

Berge, K. V. D & Mamede, S. (2013). Cognitive diagnostic error in internal medicine. *European Journal of Internal Medicine, 24*(6), 525-529. doi:10.1016/j.ejim.2013.03.006

Bickley, L. S., Szilagyi, P. G., &Hoffman, R. M. (2017). *Bates' pocket guide to physical examination and history taking* (8th ed). Philadelphia, PA: Wolters Kluwer. ISBN: 9781496338488

Black, A. T., Balneaves, L. G., Grossino, C., Puyat, J. H. & Gian, H. (2015). Promoting evidence-based practice through a research training program for point-of-care clinicians. *The Journal of Nursing Administration, 45*(1), 14-20. doi: 10.1097/NNA.0000000000000151

Bonnel, W., & Smith, K. V. (2014). *Proposal writing for nursing capstones and clinical projects.* New York: Springer Publishing. ISBN: 9780826122889

Brock, D. M., Nicholson, J. G. & Hooker, R. S. (2017). Physician assistant and nurse practitioner malpractice trends. *Medical Care Research and Review*, 74(5), 613–624. doi: 10.117/1077558716659022

Bulman, C., Lathlean, J. & Gobbi, M. (2012). The concept of reflection in nursing. Qualitative findings on student and tacher perspectives. *Nurse Education Today, 32*, e18-e13. doi: 10.1016/j.nedt.2011.10.007

Caldwell, L. & Grobbel, C. (2013). The importance of reflective practice in nursing. *International Journal of Caring Sciences*, *6*(3), 319-326. Retrieved from internationaljournalofcaringsciences.org

Chong, M.C. (2009). Is reflective practice a useful task for student nurses? *Asian Nursing Research, 3*(2), 111-119. doi: 10.1016/S1976-1317(09)60022-0.

Croskerry, P. (2003). The importance of cognitive errors in diagnosis and strategies to minimize them. *Academic Medicine*, 78, 775-780.

Croskerry, P., Singhal, G., & Mamede, S. (2013). Cognitive debiasing 1: Origins of bias And theory of debiasing. *Bristish Medical Journal Quality Safety*, 1-7. doi:10.1136/bmjqs-2012-001712

Dewy J. (1933). *How we think: A restatement of the relation of reflective thinking to the educative process*. Boston, MA: D.C. Heath. ISBN: 0669200247

Dube, V. & Ducharme, F. (2015). Nursing reflective practice: an empirical literature review. *Journal of Nursing Education and Practice, 5*(7), 91-99. doi:10.5430/jnep.v5n7p91

Dugdale, D. C., Epstein, R. & Pantilat, S. Z. (1999). Time and the patient–physician relationship. *Journal of General Internal Medicine, 14*, 34–40. doi:10.1046/j.1525-1497.1999.00263.x

Durgahee, T. (1997). Reflective practice: nursing ethics through story telling. *Nursing Ethics, 4*(2), 135-146. doi:10.1177/096973309700400205Durgahee 1997

Ely, J. W., & Graber, M. A., (2015). Checklists to prevent diagnostic errors: a pilot randomized controlled trial. *Diagnosis De Gruyter*, 2(3), 163-169. doi: 10.1515/dx-2015-0008

Ely, J. W., Graber, M. L., & Croskerry, P. (2011). Checklists to reduce diagnostic errors. *Academic Medicine*, *86*(3), 307-313. doi:10.1097/ACM.0b013e31820824cd

Ely, J.W., Kaldjian, L. C., D'Alessandro, D. M. (2012). Diagnostic errors in primary care: lessons learned. *Original Research*, *25*(1), 87-97. doi:10.3122/jabfm.2012.01.110174

Gerardi, T., (2015). The academic progression in nursing initiative. *Journal of Nursing Administration, 45*(11), 531-533. doi: 10.1097/NNA.0000000000000257

Glaze, J. E. (2001). Reflection as a transforming process: student advanced nurse practitioners' experience of developing reflective skills as part of an MSc programme. *Journal of Advanced Nursing, 34*(5), 639-647. doi.org/10.1046/j.1365-2648.2001.01793.x

Gollwitzer, P. M. (2014). Weakness of the will: is a quick fix possible? *Motivation and Emotion, 38*(3), 305-322. doi:10.1007/s11031-014-9416-3

Goyder, C. R., Jones, C. H. Heneghan, C. J., & Thompson, M. J. (2015). Missed opportunities for diagnosis: lessons learned from diagnostic errors in primary care. *British Journal of General Practice*, 65(641), e838-e844. doi: org/10.3399/bjgp15X687889

Graber, M., Kissam, S., Payne, V. L., Meyer, A. N. D. Sorensen, A., Lenfestey, N., . . . , & Singh, H. (2012). Cognitive interventions to reduce diagnostic error: a narrative review. *British Medical Journal.* doi.org/10.1136/bmjqs-2011-000149

Graber, M., Rusz, D., Jones, M. L., Farm-Franks, D., Jones, B., Gluck, C., . . . , & Eichbaum, Q. (2017). The new diagnostic team. *Diagnosis, 4*(4), 225-238. doi.org/10.1515/dx-2017-0022

Graber, M. L., Sorensen, A. V., Biswas. J., Modi, V. Wackett, A. Johnson, S, . . . & Singh H. (2014). Developing checklists to prevent diagnostic error in emergency room settings. *De Bruyter,* 1(3), 223–231. doi:10.1515/dx-2014-0019

Gleason, K., Davidson, P., Tanner, E. Baker, D. Baptiste, D. Rushton, C. (2017). Defining the critical role of nurses in diagnostic error prevention: a conceptual framework and a call to action. *Diagnosis, 4*(4), 2011-2010. doi.org/10.1515/dx-2017-0015

Grundy, S. (1993). The confidence scale development and psychometric characteristics. *Nurse Educator, 19*(1). 6-9

Hess, B. J., Lipner, R. S., Thomson, V. Holmboe, E. & Graber, M.. (2015). Blink or think: can further reflection improve initial diagnostic impressions. *Academic Medicine Journal of the Association of American Medical colleges,* 90(1), 112-118. doi:10.1097/ACM.0000000000000550

Hirt, E. R., Sherman, S. J. (1985). The role of prior knowledge in explaining hypothetical events, *Journal of Experimental Social Psychology, 21*, 519-543. doi.org/10.1016/0022-1031 (85)90023-X

Hollier, A. (2016). *Clinical guidelines in primary care* (2nd ed). LA, CA: Advanced Practice Education Associates. ISBN: 978-1892418227

Hulton, L., (2007). An evaluation of a school-based teenage pregnancy prevention program using a logic model framework. *The Journal of School Nursing*, 23(2), 105-110

Institute of Medicine (IOM). (2015). Improving Diagnosis in Health Care. National Academies Press, Washington, DC. ISBN 978-0-309-37769-0

Ip, W. Y., Lui, M. H., Chien, W. T., Lee, I. F., Lam, L. W., & Lee, D. T. (2012). Promoting self-reflection in clinical practice among Chinese nursing undergraduates in Hong Kong. *Contemporary Nursing, 41*(2), 253-262.

James, J. T. (2013). A new, evidence-based estimate of patient harms associated with hospital care. *Journal of Patient Safety,* 9(3), 122-128. doi: 10.1097/PTS.0b013e3182948a69

John, C. (2017). *Becoming a reflective practitioner* (5th ed). Hoboken, NJ: John Wiley & Sons Inc.. ISBN: 9781119193920

John, C. (1995). The value of reflective practice for nursing. *Journal of Clinical Nursing, 4*, 23-30.

Knowlton, L. L., & Phillips, C. C. (2012). *The logic model guidebook: Better strategies for great results.* Thousand Oaks, CA: Sage Publications.

Kohn, L. T., Corrigan, J. M. & Donaldson M. S (2000). *To err is human: building a safer health system*. National Academy Press. ISBN:0-309-51563-7. Retrieve from: http://www.nap.edu

Kostopoulou, O., Lionis, C., Angelaki, Ayis, S., Durbaba, S., & Delaney, B. C. (2015). Early diagnostic suggestions improve accuracy of family physicians: a randomized controlled trial in Greece. *Family Practice, 32* (3), 323-328. doi: 10.1093/fampra/cmv012

Kwok, A. C., Funk, L. M., Baltaga, R., Lipsitz, S. R., Merry, Al. F., Dziekan, G., . . . & Gawande, AA. (2013). Implementation of the world health organization surgical safety checklist, including introduction of pulse oximetry, in a resource-limited setting.*Annals of Surgery, 257* (4), 633-639.doi:10.1097/SLA.0b013e3182777fa4

Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: the embodied mind and its challenge to western thought.* New York: Basic Books. ISBN 9780465056743.

Lambe, K. A., O'Reilly, G., Kelly, B. D., & Curristan, S. (2016). Dual-process cognitive interventions to enhance diagnostic reasoning: a systematic review. *BMJ Quality & Safety Online.* doi:org/10.1136/bmjqs-2015-004417

Leigh, J., & Flynn, J. (2013). Enhance patient safety by identifying and minimizing risk exposures affecting nurse practitioner practice. *American Society for Healthcare Risk Management,* 33(2), 27-35. doi:10.1002/jhrm.21124

Levinson, W., Roter, DL., Mullooly, JP., Dull, VT., & Frankel, R.M., (1997). Physician-patient communication the relationship with malpractice claims among primary care physicians and surgeons. *JAMA,* 277(7), 553–559. doi:10.1001/jama.1997.03540310051034

Lin, C., Albertson, GA., Schilling, LM., Cyran, EM., Anderson, SN., Ware, L., . . . & Anderson, R. J. (2001). Is patient's perception of time spent with the physician a determinant of ambulatory patient satisfaction? *Arch Intern Med.,* 161(11), 1437–1442. doi:10.1001/archinte.161.11.1437

Makary, M., & Daniel, M. (2016). Medical error-the third leading cause of death in the US. *BMJ: British Medical Journal,* 353. doi: 10.1136/bmj.i2139

Malouf-Todaro, N., Barker, J. Jupiter, D., Tipton, P. H., & Peace, J. (2013). Impact of enhanced ventilator care bundle checklist on nursing documentation in an intensive care unit. *Journal Nursing Care Quality, 28*(3). 233-240. *doi:10.1097/NCQ.0b013e31827f7740*

Mamede, S., Gog, V. Berge, V. D., Kees, M. D., Saase, V. Jan, L., . . . & Schmidt, H. G. (2014). Why do doctors make mistakes? A study of the role of salient distracting clinical features. *Academic Medicine*, 89(1), 114-120. doi:10.1097/ACM.0000000000000077

Mamede, S., Loyens, S. Ezequiel, O., Tibirica, S. Penaforte, J., Schmidt, H. G. (2013). Effects of reviewing routine practices on learning outcomes in continuing education. *Medical Education.* doi:10.1111/medu.12153

Mamede, S. and Schmidt, H. G. (2004). The structure of reflective practice in medicine. *Medical Education, 38*, 1302–1308. doi:10.1111/j.1365-2929.2004.01917.x

Mamede, S. & Schmidt, H.G. (2005). Correlates of reflective practice in medicine. *Advances in Health Sciences Education 10*, 327-337. doi:org.lib proxy.fullerton.edu/10.1007/s10459-005-5066-2

Mamede, S., Schmidt, H. G. & Penaforte, J. C. (2008). Effects of reflective practice on the accuracy of medical diagnoses. *Academic Medicine Journal of the Association of American Medical Colleges, 42,* 468-475. doi:10.1111/j.13652923.2008.03030.x

Mamede, S., van Gog, T., Moura, A. S., de Faria, R. M., Peixoto, J. M., Rikers, R. M., . . . & Schmidt, H. G. (2012). Reflection as a strategy to foster medical students' acquisition of diagnostic competence. *Academic Medicine Journal of the Association of American Medical Colleges, 46,* 464-472. doi:10.1111/j.1365-2923.2012.04217.x

Mamede, S., van Gog, T., Sampaio, A. M., de Faria, R. M., M. J. P., & Schmidt, H. (2014). How can students' diagnostic competence benefit most from practice with clinical cases? The effects of structured reflection on future diagnosis of the same and novel diseases. *Academic Medicine Journal of the Association of American Medical Colleges,* 89(1), 121-127. doi:10.1097/ACM.0000000000000076

Mantzoukas, S., & Jasper, M. A. (2004). Reflective practice and daily ward reality: A covert power game. *Journal of Clinical Nursing, 12*, 925-933.

Meilinger, P. (2004). When the flying fortress went down. *Air Force Magazine*, 87(10), 78-88.

Mendu, M. L., Schneider, L. I., Aizer, A. A. Singh, K., Leaf, D. E., Lee, T. H., & Waikar, S. S. (2014). Implementation of CKD checklist for primary care providers. *Clinical Journal American Society Nephrology, 9,* 1-9. doi: 10.2215/CJN.01660214

McLaughlin, J. A., & Jordan, G. B. (2004). Using logic models. Handbook of practical project evaluation (2th ed., 7-32). San Francisco, CA: Jossey-Bass.

Muhrer, J. C. (2014). The importance of the history and physical in diagnosis. *The Nurse Practitioner*, *39*(4), 30-35. doi:10.1097/01.NPR.0000444648.20444.e6

Nicol, J.S., Dosser, I. (2016). Understanding reflective practice. *Nursing Standard*, 30 (36), 34-40**).** doi: 10.7748/ns.30.36.34.s44

Nurses Service Organization [NSO] (2017). Nurse practitioner claim report:4th edition – a guide to identify and addressing professional liability exposure. Retrieve from https://www.nso.com/

O'Donovan, M. (2006). Implementing reflection: insights from pre-registration mental health. *Nurse Education Today, 27*, 610-616.

Osterman, K. F., Kottkamp, R. B. (1993). *Reflective practice for Educators improving schooling through professional development.* Newbury Park, CA: Corwin Press.

Paley, L., Zornitzki, T., Cohen, J. Friedman, J. Kozak, N., & Schattner, A. (2011). *Arch Internal Medicine*, *171* (15), 1394-1396.doi:10.1001/archinternmed.2011.340

Patel, A. D. (2014). A case series using a care management checklist to decrease emergency department visits and hospitalizations in children with epilepsy. *Journal of Child Neurology, 29*(2), 243-246. doi: 10.1177/0883073813500851

Rhoads, J. & Jensen, M. M. (2015). *Differential diagnosis for the advanced practice nurse.* New York, New York: Springer Publishing Company. ISBN:978-0-8261-1027-5

Rodrigo-Rincon, I., Martin-Vizcaino, M.P., Tirapu-Leon, B., Zabalza-Lopez, P., Zaballos-Barcala, N., Villalgordo, P., . . . & Gost-Garde, J. (2014). The effects of surgical checklists on morbidity and mortality: a pre- and post-intervention study. *Acta Anesthesiologica Scandinavica, 59*, 205-214. doi: 10.1111/aas.12443

Ross, L., Lepper, M. R., Strack, F., & Steinmetz, J. (1977). Social explanation and social expectation: effects of real and hypothetical explanations on subjective likelihood. *Journal of Personality and Social Psychology*, 35, 817-829.

Rumayyan, A. A., Ahmed, N., Subait, R. A., Ghamdi, G. Al., Mazari, M. M., Mohamed, T., . . . & Schmidt, H. G. (2018). Teaching clinical reasoning through hypothetico-deduction is (slightly) better than self-explanation in tutorial groups: an experimental study. *Perspectives on Medical Education, 7*(2), 93-99. doi: org/10.1007/s40037-018-0409-x

Sanders, L. (2009). *Every patient tells a story.* New York, U.S: Broadway Books. ISBN: 978-0- 7679-2247-0

Saposnik, G., Redelmeier, D., Ruff, C., C., & Tobler, P. N. (2016). Cognitive biases associated with medical decisions: a systematic review. *BMC Medical Informatics and Decision Making, 16*, 138. doi: 10.1186/s12911-016-0377-1

Sarkar, U., Bonacum, D., Strull, W., Spitzmueller, C., Jin, N., Lopez, A., . . . & Singh, H. (2012). Challenges of making a diagnosis in the outpatient setting: a multi-site survey of primary care physicians. *British Medical Journal Quality Safety*. doi: 10.1136/bmjqs-2011-000541

Schmidt, H. & Mamede, S. (2015). How to improve the teaching of clinical reasoning: a narrative review and a proposal. *Medical Education in Review, 49*, 961-973. doi: 10.1111/medu.12775

Schiff G. D., Hasan, O., Kim, S, Abrams R., Cosby K., Lambert, B. L, . . ., & McNutt R.A. (2009). Diagnostic error in medicine analysis of 583 physician-reported errors. *Arch Internal Medicine,* 169(20), 1881–1887. doi:10.1001/archinternmed.2009.333

Shea, C. M., Jacobs., S. R., Esserman, D. A., Bruce, K, & Weiner, B. J. (2014). Organizational readiness for implementing change: a psychometric assessment of a new measure. *Implementation Science*, 9,7. Retrieve from: http://www.implementationscience.com/content/9/1/7

Sheeran, P., Harris, P.R., & Epton, T. (2014). Does heightening risk appraisals change people's intentions and behavior? A meta-analysis of experimental studies. *Psychological Bulletin140*(2). 511-543. doi: 10.1037/a0033065

Shifaza, F., Evans, D., & Bradley, H. (2014). Nurses' perceptions of barriers and facilitators to implement EBP in the maldives. *Advances in Nursing.* doi: 10.1155/2014/698604

Shimizu, T., Masumoto, K., & Tokuda, Y. (2013). Effects of the use of differential diagnosis checklist and general de-biasing checklist on diagnostic performance in comparison to intuitive diagnosis. *Medical Teacher, 35*(6), e1218-e1229. doi: 10.3109/0142159X.2012.742493

Sibbald, M., de Bruin, A. B., & van Merrienboer, J. J. (2013), Checklists improve experts' diagnostic decisions. *Medical Education, 47,* 301-308. doi:10.1111/medu.12080

Sibbald, M, de Bruin, A. B. H, Cavalcanti, R.B., (2013). Do you have to re-examine to reconsider your diagnosis? Checklists and cardiac exam. *British Medical Journal Quality and Safety, 22*, 333-338. doi: 10.1136/bmjqs-2012-001537

Singh, H., Giardina, T. D., Meyer, A. N.D., Forjuoh, S. N., Reis, M. D., & Thomas, E. J.. (2013). Types and origins of diagnostic errors in primary care settings. *Journal of the American Medical Association Internal Medicine*, 173(6), 418-425. doi:10.1001/jamainternmed.2013.2777

Singh, H., Meyer A. N. D., & Thomas E. J., (2014). The frequency of diagnostic errors in outpatient care: estimations from three large observational studies involving US adult populations. *British Medical Journal, Quality & Safety Online First.* doi: 10.1136/bmjqs-2013-002627

Singh, H., Thomas, E. J., & Khan, M. M. (2007). Identifying diagnostic errors in primary care using an electronic screening algorithm. *Arch Internal Medicine*, 167(3), 302-308. doi: 10.1001/archinte.167.3.302

Stevens, K. (2013). The impact of evidence-based practice in nursing and the next big ideas. *The Online Journal of Issues in Nursing, (18)*2

Sweeney, C. F., LeMahieu, A., & George, E. F. (2017). Nurse practitioner malpractice data: informing nursing education. *Journal of Professional Nursing*, *23*, 271-275.

Tacia, L., Biskupski, K, Pheley, A. & Lehto, R. H., (2015). Identifying barriers to evidence-based practice adoption: a focus group study. *Clinical Nursing Studies,* 3(2), 90-96. doi.org/10.5430/cns.v3n2p90

Tehrani, A. S., Lee, H.W., Mathews, S. C., Shore, A., Makary, M. A. Pronovost, P. J., & Newman-Toker, D. E. (2013). 25-year summary of US malpractice claims for diagnostic errors 1986-2010: an analysis from the national practice data bank. *British Medical Journal Quality Safety, 22*, 672-680. doi.org/10.1136/bmjqs-2012-001550

Teixerira, P. G.R., Inaba, J., DuBose, J., Melo, N., Bass, M., Belzberg, H., & Demetriades, D. (2013). Measurable outcomes of quality improvement using a daily quality rounds checklist: two-year prospective analysis of sustainability in a surgical intensive care unit. *Journal Trauma Acute Care surgery, 75*(4), 717-721. doi:10.1097/TA.0b013e31829d27b6

Thomassen, O., Storesund, A. Softeland, E. & Brattebo, G. (2014). The effects of safety checklists in medicine: a systematic review. *Acta Anaesteiologica Scandinavica, 58*(1), 5-18. doi: 10.1111/aas.12207

Tracynski, J., Udalova,, V. (2013). Nurse practitioner independence, health care utilization and health outcomes. *Journal of Health Economics, 58,* 90-109. doi:10.1016/j.jhealeco.2018.01001

United States census bureau. (2017). Retrieved from https://www.census.gov/quickfacts/ca

Urbach, D. R., Govindarajan, A., Saskin, R., Wilton, A. S., & Baxter, N. N. (2014). Introduction of surgical safety checklists in Ontario, Canada. *The New England Journal of Medicine,* 370, 1029-1038. doi:10.1056/NEJMsa1308261

Weng, Y-H, Cheng, C., Kuo, K. N., Chen, K-H, & Chiu, Y-W. (2015). Implementation of evidence-based practice in relation to a clinical nursing ladder system: a national survey in Taiwan. *Worldviews on Evidence-Based Nursing, 12*(1), 22-30. doi: 10.1111/wvn.12076

Wood, C., Conner, M. Sandberg, T., Godin, G., & Sheeran, P. (2014). Why does asking questions change health behaviors? The mediating role of attitude accessibility, *Psychology & Health, 29(4)*, 390-404. doi:10.1080/08870446.2013.858343

World Health Organization [WHO] (2016). Diagnostic errors: Technical series on safer primary care. Geneva, Switzerland. ISBN: 978-92-4-151163-6

# APPENDIX A

# LOGIC MODEL FRAMEWORK APPROVAL EMAIL

Titan Apps

## Seeking permission for adaptation of Logic Model

**Lisa Wyatt Knowlton** <lwyattknowlton@gmail.com> Mon, Apr 23, 2018 at 1:56 PM To: Christine Taheran <mydnp@csu.fullerton.edu>

Of course you can use any model with attribution, Christine.

I'd be delighted to see your work when ready to share.Persist. It will be terrific to have this project behind you!

5/16/2018 Cal State Fullerton Mail - Seeking permission for adaptation of Logic Model

Titan Apps

**Christine Taheran**

**<mydnp@csu.fullerton.edu>**

## Seeking permission for adaptation of Logic Model

**Lisa Wyatt Knowlton** <lwyattknowlton@gmail.com>
Wed, Apr 25, 2018 at 2:34 PM To: Christine Taheran <mydnp@csu.fullerton.edu>

If you are adapting the common program logic model for use in published material ... Yes, you may use the model with attribution.
[Quoted text hidden]

# APPENDIX B

## REFLECTIVE PRACTICE MODEL APPROVAL EMAIL



Titan Apps

**Christine Taheran**

**<mydnp@csu.fullerton.edu>**

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## Permission for Adaptation of Reflective Practice Model

**H.G. Schmidt** <schmidt@essb.eur.nl>
Fri, May 4, 2018 at 1:53 AM To: Christine Taheran <mydnp@csu.fullerton.edu>
Cc: Silvia Mamede <s.mamede@erasmusmc.nl>

**Christine, I give you permission to cite and adapt the Reflective Practice Model from the Mamede and Schmidt,**
**2008 to be use in your DNP project**

---

Henk G. Schmidt Tel: +31 6 2079 5919
Institute of Psychology
Erasmus University schmidt@essb.eur.nl

Postal address: Visiting address:
P.O. Box 1738 Building T, Room T 13-25
3000 DR Rotterdam Burgemeester Oudlaan 50
The Netherlands 3062 PA Rotterdam
Homepage: http://www.psyweb.nl/homepage/henk_schmidt.htm

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# APPENDIX C

## GENERAL CHECKLIST

- ☐ Involve patient in the diagnostic process and in their care
  - Patients are an important member of their care team
  - Review differential diagnosis checklist with patients
- ☐ Obtain your own comprehensive medical history
  - Listen to patients as they will tell you the diagnosis
- ☐ Perform Complete, focused, and detailed physical exam.
- ☐ Testing diagnostic hypothesis by confirming with complete history, physical and diagnostic studies
- ☐ Formulate differential diagnosis list
- ☐ Practice reflection during the diagnostic process
- ☐ Take reflective time out and confirm the accuracy of the diagnosis with Safer Dx Instrument
- ☐ Schedule follow up appointment to follow up on patients conditions
- ☐ Review diagnostic checklist with patients – history, physical, test results suggestive of working diagnosis , alternative condition or additional evaluation, including referral
- ☐ Educate patients about the diagnostic process. Since diagnosing is evolving process, share with plans with patients :
  - Educate patients to watch for danger signs and when to go to ER.
  - Educate patients to re-schedule appointments if signs/symptoms persists
- ☐ Make sure to document thoroughly. If not documented, it was not done
- ☐ Did the patient presents with the same symptoms recently. Review the recent medical records to assess and compare medical history, physical exam, diagnostic studies, differential diagnosis, and treatment plans.

## APPENDIX D

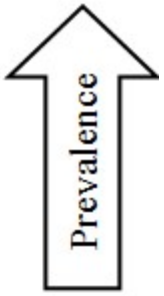
## SPECIFIC CHECKLIST – DIAGNOSTIC TIME OUT

- ☐ Did I personally obtain history of present illness?
- ☐ Did I review all medical records
  - Present medical history
  - Past medial history
  - Family history
  - Past medical records
- ☐ Did I perform a comprehensive exam
- ☐ Did I consider all potential possibilities including atypical presentations?
- ☐ Did I consider all the danger signs
- ☐ Did I consider all the "don't miss" diagnosis"
- ☐ Did I consider "worst-case-scenarios?"
- ☐ Did I prioritize diagnosis with life-threatening conditions first?
- ☐ Did I order and follow up on all diagnostic studies
- ☐ Did I formulate differential diagnosis
- ☐ Did I base the diagnosis on any biases
- ☐ Was the diagnosis given to me correct?
- ☐ Were there any inconsistencies that did not fit the big picture?
- ☐ Did I diagnose under time-pressure environment?

## APPENDIX E

## DIFFERENTIAL DIAGNOSIS CHECKLIST

**#8 - Chest pain**
Chest wall pain
Gastroesophageal reflux disease
Pleurisy, pleuritis
*Psychiatric
Asthma
♠*Coronary disease (myocardial infarction, angina)
♠*Pulmonary embolus
Herpes zoster
♠*Pneumonia, bronchitis
♠Pneumothorax
Esophageal spasm
Pericarditis, myocarditis
Mitral valve prolapse
Idiopathic chest pain
♠Acute chest syndrome (sickle cell anemia)
♠Tuberculosis
♠Aortic stenosis
♠*Dissecting aortic aneurysm
♠*Tumor
Pulmonary hypertension
♠Esophageal rupture
Precordial catch syndrome
♠Mediastinitis
♠*Aspergillosis
*Sarcoidosis
♠*Spinal cord compression
Thoracic endometritis




**♠ Don't miss**
*** Commonly missed**

# APPENDIX F

## APPROVAL FOR UTILIZATION AND ADAPTATION OF GENERAL, SPECIFIC, AND DIFFERNTIAL DIAGNOSIS CHECKLISTS

Titan Apps

**<mydnp@csu.fullerton.edu>**

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## Permission to utilize and adapt Checklists in DNP Project

**Ely, John** <john-ely@uiowa.edu>
Tue, Apr 24, 2018 at 5:48 AM To: Christine Taheran <mydnp@csu.fullerton.edu>

Dear Ms. Taheran,

Thanks for your interest in our checklists. You certainly have my permission to use and adapt the checklists. I'm attaching the most recent version of the differential diagnosis checklists. Also an article about how to use them. Let me know if you have any questions or want to discuss further. My office phone is 319-384-7533.

You might also be interested in the Society to Improve Diagnosis in Medicine (SIDM) and might want to attend their annual meeting: Diagnosis Error in Medicine (DEM) (November 4-6, 2018 in New Orleans).

Best wishes,

John Ely, MD
University of Iowa

# APPENDIX G

## COGNITIVE BIAS CHECKLIST

Directions: Please check the item that applies to your perception.

- **Affective Bias** – I like or dislike the patient too much?
  [ ] Consideration- be cognizant of your feelings about the patients you are providing care to because it may affect your clinical reasoning during the diagnostic process.
- **Anchoring Bias** - Did I base my diagnosis on early impression or interpretation, ignoring subsequent evidence?
  [ ] Consideration – provider needs to consider all differential diagnoses, not just the initial diagnosis.
- **Premature Closure Bias** - Did I formulate the diagnosis before listening to the patient's complete story?
  [ ] Consideration – Need to listen to a patient's complete story and consider all alternative diagnoses and possibilities, including the atypical.
- **Confirmation Bias** - Did I only ask questions only to confirm the diagnosis and failed to consider other evidence that is more persuasive or convincing? Anchoring bias, Premature closure bias, and Confirmation bias are very similar; these three biases usually occur concurrently.
  [ ] Consideration – ascertain medical evidence to refute the diagnosis, not just to confirm the diagnoses.
- **Availability Bias** - Am I working with limited available diagnosis and ask patients about symptoms/signs pertaining only to the limited list of available diagnosis?
  [ ] Consideration – needs to utilize the differential diagnosis checklist to broaden the differential diagnosis
- **Diagnosis Momentum Bias** – Has the working diagnosis given to you by other nurses, physician assistants, nurse practitioners, and physicians built enough momentum and eventually became the final diagnosis, excluding other potential differential diagnosis?
  [ ] Consideration – providers need to be cognitively aware of the diagnostic process and consider all potential possibilities and not just simply accept the diagnoses that been passed on
- **Representativeness Restraint** – the Diagnostic process is focusing and basing on typical signs and symptoms and failed to consider atypical presentations.
  [ ] Consideration – providers need to follow Integrated Diagnostic Practice Guideline and walk through the reflective practice, so all alternative possibilities are considered
- Did I formulate the diagnosis when I was tired or in time constraint? All biases
  [ ] Consideration – providers need to make a diagnostic decision during a sound and clear mind, not in rush or time pressure circumstances. Providers need to wait and formulate the diagnosis when not fatigue and have time to critically and comprehensively evaluate

# APPENDIX H

# PERMISSION FOR UTILIZATION AND ADAPTATION FOR COGNITIVE BIAS CHECKLIST

## Seeking Permission to Utilize and Adapt Cognitive Biases Checklist

**Pat Croskerry** <croskerry@eastlink.ca> Tue, Jul 24, 2018 at 5:28 AM
To: Christine Taheran <mydnp@csu.fullerton.edu>, xkerry@accesscable.net

Hi Christine: as far as I know, you don't need permission to use or adapt anything published in the literature – simply citing the source of the original work is considered sufficient. You can revise anything you like – simply publish what you have done and say it is an adaptation of the original work.

Copyright is different – if you reproduce something verbatim – exactly the same as the original then you usually get permission, especially for figures.

As far as I am concerned, you are welcome to use anything we have written and adapt it as you see fit – that was our goal in publishing the work originally.

On another note, I saw the response from John Ely to you. I cannot support the notion that biases can't be corrected – it simply isn't true - we do it all the time. I'm not saying it is easy, but it definitely can be done and a recent review concludes that the majority of de-biasing strategies work.

I will attach a chapter from out recent book on the subject.

Best Regards,

Pat Croskerry, MD, PhD, FRCP(Edin)
Professor, Department of Emergency Medicine,
Director, Critical Thinking Program,
Dalhousie University Medical School
Halifax, Nova Sotia
CANADA

# APPENDIX I

## SAFER DX INSTRUMENT

Rate the following items for the episode of care under review

(1 2 3 4 5 6)
1 = Strongly Agree 6 = Strongly Disagree

1. The history that was documented at the patient-provider encounter was suggestive of an alternate diagnosis, which was not considered in the assessment.
   1 2 3 4 5 6
2. The physical exam documented at the patient-provider encounter was suggestive of an alternate diagnosis, which was not considered in the assessment.
   1 2 3 4 5 6
3. Diagnostic testing data (laboratory, radiology, pathology or other results) associated with the patient-provider encounter were suggestive of an alternate diagnosis, which was not considered in the initial assessment.
   1 2 3 4 5 6
4. The diagnostic process at the initial assessment was affected by incomplete or incorrect clinical information given to the care team by the patient or their primary caregiver1
   1 2 3 4 5 6
5. The clinical information (i.e., history, physical exam or diagnostic data) present at the initial assessment should have prompted additional diagnostic evaluation through tests or consults.
   1 2 3 4 5 6
6. The initial assessment at an earlier visit was not appropriate, given the patient's medical history and clinical presentation
   1 2 3 4 5 6
7. Alarm symptoms or "Red Flags" (i.e., features in the clinical presentation that are considered to predict serious disease) were not acted upon at an earlier assessment.
   1 2 3 4 5 6
8. Diagnostic data (laboratory, radiology, pathology or other results) available or documented at the initial assessment were misinterpreted in relation to the subsequent final diagnose.
   1 2 3 4 5 6
9. The final diagnosis was an evolution of the initial presumed diagnosis.
   1 2 3 4 5 6
10. In conclusion, based on all the above questions, the episode of care under review had a diagnostic error
    1 2 3 4 5 6

In all questions, a rating of 1 most likely represented a diagnostic error and a rating of 6 indicated that no error was identified.

## APPENDIX J

## PERMISSION FOR UTILIZATION AND ADAPTATION OF SAFER DX INSTRUMENT

Titan Apps

### Permission to use Safer Dx Instrument

**Singh, Hardeep** <hardeeps@bcm.edu> Mon, Apr 23, 2018 at 12:03 PM To: Christine Taheran <mydnp@csu.fullerton.edu>

Sure, please feel free to use, adapt, and cite. Just to let you know we may in future modify the instrument slightly mostly for wording but that won't be happening for a while. So for now, please go ahead.

Thank you for your interest,
Hardeep

# APPENDIX K

# EMAIL TO RECRUIT PARTICIPANTS

**EXEMPT INFORMATIONAL COVER LETTER**

REDUCING NURSE PRACTITIONER MEDICAL ERRORS: AN EBP GUIDELINE WITH REFLECTIVE PRACTICE ALGORITHM

To Project Participant:

You are invited to participate in this quality improvement project conducted by Dr. Glenn Raup, Principal Investigator, and Christine Taheran, a Doctor of Nursing Practice student at California State University, Los Angeles. In this project we hope to learn more about failure to diagnose, medical errors among adult and family nurse practitioners. You were invited to participate in this project as part of an educational program which is designed to improve practice among Nurse Practitioners. All members of the Inland Empire and San Diego Chapters of the California Association of Nurse Practitioners (CANP) were invited to participate. The project will focus on strategies used to prevent medical errors. We hope that our project will lead to the short-term goal of enhancement of knowledge in the failure to diagnose medical errors and the increase the participant's willingness to implement the evidence base practice guideline provided. Another benefit is that use of the guideline may lead to a reduction of medical malpractice claims in the long term. Participants will also benefit from participation in the education as it will increase knowledge and skill for avoiding medical errors.

The participants will voluntarily participate in the educational program, since they will self-select to attend the program. The participants will be asked to review and sign a consent form. After consent is provided, participants will complete the pre-surveys, consisting of Demographic Survey, Practice Setting Survey, and C-Scale. After the pre-surveys are completed, the educational program will be provided by Christine Taheran. Immediately after the educational program, the post-survey will be administered, which consist of the C-Scale and ORIC. Each survey is anticipated to take up to five minutes to complete. The total time to complete the surveys will take up to 25 minutes. The educational program will last approximately 50 minutes. The total duration of participant's involvement in the project will be 75 minutes. Participants will receive one continuing education unit as compensation for their participation.

Although there are minimal risks associated with breach of anonymity or confidentiality, all necessary precautions and steps will be taken to ensure that data are only accessible to the investigators. Participation in this project is voluntary. All participants may withdraw at any time. Participants may choose to skip any questions they do not want to answer. Participants could choose to only participate in the educational program without any consequences or repercussions. There are no medical risks for participants who complete the surveys and attend the educational program.

Reports resulting from this project will not identify you as a participant. All information gathered in this project will remain confidential and anonymous. No data will contain identifying information. The surveys will not require participants to identify themselves; no names or identifications will be asked from participants. The data used will not be identified and will be stored in a separate locked cabinet three years after completion of the project. The data will be stored on a password-protected computer that only the authors will have access to. As part of the CANP customary registration fee, the education will cost 5 to 10 dollars to participate as it would for any educational program offered. However, the authors will not receive these funds as they are associated with the costs charged by the Chapters to participate. The data obtained from this project may be used for publication purposes with no monetary gain on the part of the authors. Participants will have the opportunity to increase their knowledge in the area of medical errors and medical malpractice, thus improving the skills needed to engage in reflective diagnostic process.

If you have any questions about this project at any time, please call Christine Taheran at 714-494-5850 or email her at christinetaheran@gmail.com. Also, you may contact Dr. Glenn Raup, Principal Investigator at 714.215.0983 or contact him via email at Glenn.Raup@stjoe.org.

THIS PROJECT HAS BEEN DETERMINED TO BE EXEMPT FROM REVIEW AND APPROVAL BY THE CALIFORNIA STATE UNIVERSITY, LOS ANGELES INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS IN RESEARCH.

# APPENDIX L

## CANP SAN DEIGO CENTRAL CHAPTER CE APPROVAL

**Erin R. Meyer**
to me, Andrew, Elizabeth

Hi Christine,

The event is approved for one CE. I just needed the event on the website so I could actually issue the CE credit.

Thank you,

Erin Meyer

**Erin Meyer**
Member Services Director
1415 L Street, Suite 1000
Sacramento, CA 95814
916 441-1361
canpweb.org

Power in Practice

CANP CALIFORNIA ASSOCIATION FOR NURSE PRACTITIONERS

# APPENDIX M

## PARTICIPANT CONSENT

Dear Nurse Practitioner:

You are invited to participate in a quality improvement (QI) project titled, "FAILURE TO DIAGNOSE EDUCATIONAL GUIDELINE." Christine Taheran, a Doctor of Nursing Practice (DNP) Student at California State University, Fullerton (CSUF), is conducting this QI project. Christine Taheran is working with the support of the research committee members from CSUF DNP Program. Continuing education units may be offered.

The purpose of this QI project is to assess the impact of failure to diagnose educational program and the intent to change. The knowledge of the training and intent to change practice will be assessed with the Confidence Scale (C-Scale) and Organization Readiness of Intent to Change (ORIC) Assessments. Also, surveys will be conducted to assess the participant's professional compositions and practice types through the Demographic and Practice Setting Surveys.

It is the hope of this educational program will increase knowledge and confidence among NPs to implement strategies to timely and accurately diagnose. Also, the long-term goal is that NPs will implement the guideline in their daily practice. Strict compliance with the Internal Review Board (IRB) will be adhered too. The data collected will remain in the author's possession in all times in a password-protected computer.

Also, strict anonymity of the participant and the results of the surveys and assessments will not be identified because the name of the participant will not be noted on any forms. The surveys and assessments will not contain any identifiable information. You may skip any question on the survey, and you may stop participating at any time should you feel uncomfortable. The survey may take up to 15 minutes to complete. There are no anticipated negative consequences from participating in this project.

The results from this project will be collected, analyzed, and may be published. The results may also be presented at professional conferences. All information provided will be kept confidential and anonymous. The names of the participants will not appear in any project or publications. Participant responses will be reported with no identifying features as to the individual. Following data compilation, analysis and interpretation, all data collected during the process of the project will be destroyed.

I hope you will participate in this effort to improve knowledge on failure to diagnose medical errors among nurse practitioner who work in outpatient settings. Your participation is entirely voluntary and will not affect your membership with CANP. Your attendance on this educational program is not contingent on your participation in this project.

# APPENDIX N

## PERMISSION TO ADAPT C-SCALE

This Agreement between Ms. Christine Taheran ("You") and Wolters Kluwer Health, Inc. ("Wolters Kluwer Health, Inc.") consists of your license details and the terms and conditions provided by Wolters Kluwer Health, Inc. and Copyright Clearance Center.

| | |
|---|---|
| License Number | 4341200993518 |
| License date | May 03, 2018 |
| Licensed Content Publisher | Wolters Kluwer Health, Inc. |
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| Licensed Content Author | Susan Grundy |
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| Number of figures/tables/illustration | 1 |
| Figures/tables/illustrations used | The C-Scale |
| Author of this Wolters Kluwer article | No |
| Title of your thesis / dissertation | Development and implementation of a reflective practice guideline to reduce failure to diagnose medical error by adult and family nurse practitioners in the primary care setting |
| Expected completion date | Jun 2019 |
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# APPENDIX O

## PERMISSION TO ADAPT ORIC

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Permission to Adaptation of ORIC to assess willingness to change nursing practice

**Shea, Christopher Michael** <Chris_Shea@unc.edu>
Wed, Apr 25, 2018 at 4:47 PM To: Christine Taheran <mydnp@csu.fullerton.edu>

Hello Christine,

I'm happy to hear about your interest in using the ORIC in your project. You are welcome to use it. We just ask that you cite it, as you have indicated in your email that you will do.

Attached is the 10-item version, which includes the items that performed best in our assessment, as reported in the
2014 paper.

All the best,
Chris

# APPENDIX P

## OPERATIONAL DEFINITIONS

- Adult/Primary Care Practice – practitioners routinely provide patient care to an adult in the primary care outpatient settings.
- Claim – the claim is any demand for damages or harm, whether or not a lawsuit has been filed (NSO, 2017)
- Closed Claim – a claim that has been settled with or without payments made
- Diagnostic Breakdown (disconnect) – the breakdown of the diagnostic process occurs when one of the elements of the care is missing by clinicians failure to perform (Singh et al., 2013)
- Diagnostic error – refer to a diagnosis-related medical error such as failure to diagnose, delayed diagnose, and misdiagnosis (Singh et al. 2013)
    1. Failure to diagnose is a failure to formulate a medical condition that is present
    2. Delayed diagnose occurs when the medical condition was untimely made
    3. Misdiagnosis is an inaccurate assessment of a medical condition or formulating treatments for a condition that is not present
- Diagnostic Process is refer to the process evaluation of patients to obtain a diagnosis, which consist of obtaining medical history, performing physical examination, ordering diagnostic tastings, and formulating differential diagnoses.
- Indemnity payment – money paid on behalf of the providers in settlement of a claim
- Medical Error – an omission or failure to act that fall below the standard of care that may result in patient harm (Singh et al., 2013)
- Medical Malpractice (also known as a professional liability) – Failure to follow the standard of care by the provider, breach of duty by omission or failure to act, resulting in injury
- Malpractice- refer to acts of negligence or departure outside of the standard of care on the part of the nurse practitioner or any provider (Brock et al. 2016)
- National Practitioner Data Bank (NPDB) - Health Care Quality Improvement Act of 1986 mandate for all medical providers to report any judgment or settlement to NPDB with 30 days of payment. Claims not resulted in payment are not required to report to NPDB (NSO, 2017; Sweeney et al., 20170.
- Nurse Practitioner (Provider) –mid-level provider who assess, evaluate, diagnose and treat patients under the standardized protocol and guidelines under the supervision of physician.

# APPENDIX Q

## DEMOGRAPHIC SURVEY

1. What is your Gender?
    a. Female
    b. Male
    c. Other: _____
2. How old are you?
    a. 18-24 years old
    b. 25-34 years old
    c. 35-44 years old
    d. 45-54 years old
    e. 55-64 years old
    f. 65-74 years old
    g. 75 years or older
3. Please describe Ethnicity:
    a. White
    b. Hispanic or Latino
    c. Black or African American
    d. Native American or American Indian
    e. Asian / Pacific Islander
    f. Other:_____
4. What is your highest degree?
    a. Ph.D.
    b. DNP
    c. Master's
    d. Bachelor's
    e. ADN
    f. Other :_____
5. How long have you been practicing as a nurse practitioner?
    a. 1-5 years
    b. 6-10 years
    c. 11-15 years
    d. 16-20 years
    e. 21-25 years
    f. 26-30 years
    g. 31-35 years
    h. 36-40 years
    i. 41 +
6. Employment:
    a. Full-time
    b. Part-time
    c. Not employed
    d. Retired
7. What specialty are you certified in?
    a. Adult Nurse Practitioner
    b. Family Nurse Practitioner
    c. Women's Health Nurse Practitioner
    d. Primary care specialty
    e. Internal Medicine
    f. Other: _____

# APPENDIX R

## PRACTICE SETTING SURVEY

1. What specialty are you currently working in?
    a. Adult Nurse Practitioner
    b. Family Nurse Practitioner
    c. Primary care specialty
    d. Internal Medicine
    e. Geriatric Medicine
    f. Women's Health Nurse Practitioner
    g. Other: _____
2. What type of practice setting do you work in?
    a. Outpatient Settings
        i. Doctor's office
        ii. Outpatient clinic
        iii. Primary care clinic
        iv. Internal Medicine
        v. Other: _____
    b. Inpatient
        i. Hospital
        ii. Emergency Room
        iii. Nursing Facility
        iv. Rehabilitation Facility
        v. Other:_____
3. If you are an Adult or Family Nurse Practitioner, what other fields of practice have you worked in? Select all that apply:
    a. Dermatology
    b. Women's Health
    c. Pediatric
    d. Urgent Care
    e. Emergency Room
    f. Hospital
    g. Other: _____
4. If once you practice in adult or primary care setting, what was/were the reason(s) for switching to different specialty? Select all that apply.
    a. Not enough time to see patient
    b. High patient load
    c. Complexity of patient's presentation
    d. Lack of administrative support
    e. Lack of resources
    f. Lack of educational support
    g. Lack of guidance
    h. Other: _____
5. Do you feel rushed or feel that you don't have enough time to adequately evaluate your patients?
    a. Yes
    b. No
6. Do you regularly practice reflection when assessing, evaluating and treating patients?
    a. Yes
    b. No

7. Are you integrating any interventions or strategies to help your reduce potential medical errors?
    a. Yes
    b. No
8. Do you currently utilize a checklist as a diagnostic aid when assessing, gathering and diagnosing patients?
    a. Yes
    b. No
9. Do you utilize the Safer Dx Instrument to verify the presence or absence of diagnostic medical error?
    a. Yes
    b. No
10. Are you open to implementing an evidence based practice guideline?
    a. Yes
    b. No
11. Have you had any medical malpractice claims filed against you due to an allegation of diagnosis-related medical errors?
    a. Yes
    b. No
    c. Not sure
    d. Prefer not to answer
12. What is the age distribution of your patient population? (circle all that apply)
    a. Under 18 years old
    b. 18 -24 years old
    c. 25-30
    d. 31-35
    e. 36 – 40
    f. 41-plus

# APPENDIX S

## C-SCALE ASSESSMENT

Directions: Circle the number which best describes how you perceive your current ability to use the Integrated Diagnostic Practice Guideline to assist during your diagnostic process. Select only ONE number.

1. I am certain of my performance of my diagnostic process when using the Integrated Diagnostic Practice Guideline is correct:

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| not at all certain | certain for only a few steps | fairly certain for a good number of steps | certain for almost all steps | absolutely certain for all steps |

2. I feel that I can perform the diagnostic process using the Integrated Diagnostic Practice Guideline without hesitation:

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| I have much hesitation | a fair amount of hesitation | a good part of it without hesitation | almost completely without hesitation | absolutely no hesitation |

3. My performance would convince an observer that I'm competent with using the Integrated Diagnostic Practice Guideline:

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| not at all | agree, a little | for much of it | for almost all of it | for absolutely all of it |

4. I feel sure of myself as I perform the diagnostic process using the Integrated Diagnostic Practice Guideline:

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| not at all | very little | for much of it | for almost all of it | for absolutely all of it |

5. I feel satisfied with my performance of the diagnostic process using the Integrated Diagnostic Practice Guideline:

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| not at all | very little | for much of it | for almost all of it | absolutely satisfied with all of it |

# APPENDIX T

## ORIC ASSESSMENT

Direction: Circle the number which best describes how you perceive your willingness to implement the Integrated Diagnostic Practice Guideline. From 1 in "disagree" to 5 "agree", select only ONE number.

1. I am committed to implementing the Integrated Diagnostic Practice Guideline

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Disagree | | Neutral | | Agree |

2. I am determined to implement the Integrated Diagnostic Practice Guideline in my practice

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Disagree | | Neutral | | Agree |

3. I am motivated to implement the Integrated Diagnostic Practice Guideline in my practice

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Disagree | | Neutral | | Agree |

4. I want to implement the Integrated Diagnostic Practice Guideline in my practice

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Disagree | | Neutral | | Agree |

5. I need to implement the Integrated Diagnostic Practice Guideline in my practice

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Disagree | | Neutral | | Agree |

6. I believe practicing the Integrated Diagnostic Practice Guideline will benefit my practice

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Disagree | | Neutral | | Agree |

7. I believe this change by implementing the Integrated Diagnostic Practice Guideline will help my practice

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Disagree | | Neutral | | Agree |

8. I feel that implementing the Integrated Diagnostic Practice Guideline is a good idea

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Disagree | | Neutral | | Agree |

9. I value this change of incorporating the Integrated Diagnostic Practice Guideline in my practice.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Disagree | | Neutral | | Agree |

10. I know what it takes to implement the Integrated Diagnostic Practice Guideline in my practice.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Disagree | | Neutral | | Agree |

# APPENDIX U

## INTEGRATED DIAGNOSTIC PRACTICE GUIDELINE WITH REFLECTIVE PRACTICE ALGORITH

### "SBAR" OVERVIEW OF PRACTICE GUIDELINE

**SITUATION:** The Doctor of Nursing (DNP) Project was conducted to address the failure to diagnose (FTD) which is a type of medical error. Failure to diagnose occurs when an unintentional omission or failure to timely and accurately diagnose a medical condition occurs. It is usually the result of a breakdown within the diagnostic process and involves a practice change in order to remediate it (Balla et al., 2012; Singh et al., 2013).

**BACKGROUND:** The limited time spent evaluating patients; especially in the primary care setting has been associated with medical errors and medical malpractice claims (Al Qahtani et al., 2016; Dugdale et al., 1999; Levinsin et al., 2012). The proportion of NPs entering primary care practice between 2010 and 2025 is expected to increase from 19% to 29% (Auerback et al., 2013). Failure to diagnosis is the most prevalent claim made against adult/primary care NPs (NSO, 2017). A recent detailed review of paid claims revealed that FTD had the highest percentage of mal-practice at 26.59% (Sweeney et al. 2017). Key contributing factors to FTD have been identified as a failure to gather a complete medical history, perform a thorough physical examination, order diagnostic studies, consider differential diagnosis, recognize cognitive bias and reflection on practices (Balla et al., 2012; Ely et al., 2011; Singh et al. 2013).

**ASSESSMENT:** An Integrated Diagnostic Error Reduction Practice Guideline has been derived from the literature to assist Nurse Practitioners in mitigating the risk of FTD. The guideline is a synthesis of the Logic and Reflective Practice Models that incorporate evidence-based practices that are used as part of the diagnostic evaluation checklists with reflective practice in the form of a comprehensive diagnostic algorithm.

**RECOMMENDATION:** Nurse Practitioners in the primary care practice setting should use the attached Logic and Reflective Practice Algorithm to reduce the risk of the medical error and FTD in the primary care practice setting.

Integrated Diagnostic Practice Guideline

DEVELOPMENT OF INTEGRATED MODEL

**Evidence-Based Diagnostic Guideline with Reflective Practice Algorithm**

This Evidence-Based Diagnostic (EBD) Guideline with a Reflective Practice Algorithm (see Table 1) was developed through the integration of the Logic Model (McClaughlin et al., 2004) and the Reflective Practice Model (Mamede & Schmidt, 2004). The algorithm provides a step-by-step procedure designed to improve diagnostic accuracy through comprehensive recognition of patient and provider factors that contribute to failure to diagnosis (FTD). The algorithm is evidence-based which includes the Reflective Practice Model (RPM) and Diagnostic Tool Kit (DTK), that consists of General Checklists, a Specific Checklist, a Differential Diagnosis Checklist, Cognitive Bias Checklist and a Safer Dx Instrument (Al-Mutairi et al., 2016; Graber et al., 2014; Ely et al. 2011; Knowlton & Phillips, 2012). The evidence-based recommendations in this guideline have been proven by many studies to increase diagnostic accuracy. These strategies outlined in this guideline are also supported by current peer-reviewed clinical guidelines (Bickley et al., 2017; Rhoads & Jenson, 2015).

Further, the algorithm encourages the use of a diagnostic team, which includes patients and their families, as well as other healthcare providers. The algorithm includes the utilization of the DTK as resources to assist in the diagnostic process (Ely et al., 2011; Gleason et al., 2017; Institute of Medicine [IOM], 2015). A breakdown in the diagnostic process occurs when any of the key contributing factors to FTD are not performed. If any steps in the diagnostic process are not performed, the providers will need to re-start from the initial phase of reflection. Lastly, the Logic and Reflective Practice Algorithm were reviewed and critiqued by content experts, Dr. Mark Graber and Dr. John Ely. Their diagnostic checklists are included as resources in the DTK and the reference section of this guideline.

This EBD Guideline consists of three (3) phases:
Phase 1: Inputs/Resources = Deliberate Induction and Deliberate Deduction;
Phase 2: Outputs/Activities = Testing the Diagnostic Hypothesis and
Phase 3: Outcomes = Meta-Reasoning.
Along with the External Factors/Assumptions related to the NP's willingness to dedicate time to Reflect within each phase thereby integrating reflective behavior.

**Phase 1: Inputs/Resources = Deliberate Induction/Deliberate Deduction**

Deliberate Induction is the first part of Phase 1 and is triggered when patients present with complaints or symptoms. This phase involves taking time to identify problems that need to be solved, search for additional possibilities or explanations. In this phase, providers encounter uncertainties, ambiguities, or complicated circumstances which may hamper their diagnosis process. In the deliberate induction period, the providers need to involve the patient and their family members in the diagnostic process in order to obtain a complete medical history and physical examination (Graber et al., 2017). Providers obtain a thorough medical history by asking open-ended questions and listening to the patients' complete stories. Also, they should obtain the patient's history to guide them in performing a systematic, detailed physical examination (Bickley et al., 2017).

Integrated Diagnostic Practice Guideline

DEVELOPMENT OF INTEGRATED MODEL

Patients and their families are valuable members of their diagnostic team. Patients serve as a great resource because the story that the patient tells the provider will lead to the diagnosis (Rhoades & Jenson, 2015; Sanders, 2009). It is essential that providers personally ascertain or verify the information directly from the patients to obtain an accurate account of the events that lead to the condition, and not rely solely on information obtained from family members or staff when possible. Patient's families are also great resources because they may be able to fill in the gaps of information that the patient may not recall simply due to the nature of their condition (IOM, 2015). During this phase, the providers may encounter ambiguities and uncertainties when deciphering patient complaints. Providers should be able to reflect on the information obtained from patients and their families to help them derive a diagnosis. The use of the resources in the Diagnostic Tool Kit (DTK), especially General Checklist, can assist with the initial diagnostic process. The DKT could be utilized to gather and further clarify or confirm presenting signs and symptoms (Rhoads & Jenson, 2015).

During the second part of Phase 1, the period of Deliberate Deduction, the providers gather all the inputs and resources by exploring results of alternative explanations or possibilities, such as exploring other signs and symptoms by asking additional questions to confirm or rule out medical conditions or differential diagnosis (Mamede et al. 2004; Rhoads & Jenson, 2015). Deliberate Deduction involves formulating a differential diagnosis by ordering diagnostic tests, including utilization of the Differential Diagnosis Checklist resources in the DTK to compare the common symptoms with other common and alternative diagnoses (Rhoads & Jenson, 2015). During Deliberate Deduction, the NPs need to contemplate all uncertainties, possibilities, and diagnoses by analyzing patient's medical health histories and clinical presentations. At the end of this phase, the first reflective practice checkpoint occurs, which will serve as a diagnostic time out with the aid of the Specific Checklist and Cognitive Bias Checklist in the DKT. Providers should identify their assumptions up to this point and begin to address issues by using reflective practice to ask further targeted questions, review additional medical histories, past medical history, and perform a thorough physical examination, including the ordering of appropriate diagnostic tests. This diagnostic process of obtaining a thorough medical history and complete physical examination with appropriate diagnostic study is essential because it may increase diagnostic accuracy by 90% (Paley et al., 2011). The provider needs to actively reflect and consider the following specific issues related to this phase: the "Red Flags," the "Don't Miss", and the "Commonly Missed" diagnosis to determine if they were considered in their diagnostic process (Bickley et al., 2017; Rhoads & Jenson, 2015). It is essential for providers to keep an open mind and consider uncommon diseases.

**Phase 2 Outputs/Activities = Testing Diagnostic Hypothesis**

In Phase 2, providers will need to test the output and activities used during the diagnostic process by: 1) reviewing the patient's chief complaints, 2) reviewing the medical history and physical examination obtained to date and obtain a more detailed focused history and physical as needed, 3) reviewing the differential diagnosis list and determine if additional diagnostic tests are needed to confirm or rule out the diagnosis on the differential diagnosis and 4) establish the most likely

diagnosis(es) based on a thorough, focused deliberation process and compare the reasoning used to support the diagnostic hypothesis through verification with the DTK (Graber et al., 2014; Ely et

al. 2011). Since the five behaviors of the RPM shift back and forth during the diagnostic activities, testing the Diagnostic Hypothesis phase may involve re-confirmation of the diagnostic activities as well verifying all uncertainties and possibilities to confirm the diagnosis (Mamede & Schmidt, 2004). This phase is essential in the identification of the findings that support the hypothesis, match all potential diagnoses, rule out the diagnoses that are not consistent with the presenting signs and symptoms, and select the "most likely diagnosis" with the intention of not missing a diagnosis or a life-threatening condition (Bickley et al., 2017). It is important to consider all atypical medical conditions, including alternative possibilities that might have been missed, categorize them, and give the highest priority to the life-threatening conditions (Bickley et al., 2017; Rhoads & Jenson, 2015). The depth of knowledge of the differential diagnosis is essential because the differential diagnosis is reflective of the provider's knowledge base of all diseases (Rhoads & Jenson, 2015). The highest medical malpractice claims occur due to the breakdown in the failure to consider all potential diagnoses, which is 81% (Singh et al., 2013). Thus, it is imperative that the providers utilize the differential diagnosis checklist in the DTK to increase the breadth and depth of the potential diseases to consider. Once all the uncertainties have been considered, the provider has the second reflective practice checkpoint in which they would need to ask themselves, "were the decisions or diagnosis based on cognitive biases?" At this point in Phase 2, providers must be actively aware of and consider potential cognitive biases, such as premature closure which may lead to diagnostic error (Rhoads & Jenson, 2015). Upon reflection, if the provider's answer is yes, s/he would have to reconsider what these biases are/were and address each type by starting back at Phase 1.

**Phase 3 Outcomes = Meta-Reasoning**

This phase of the diagnostic process examines the outcomes through the action of Meta-Reasoning, which consists of critically reviewing or analyzing the outcome such as diagnosis, conclusions, assumptions, or belief through the use of the Safer Dx Instrument to validate the diagnosis. Meta-Reasoning is self-awareness that serves as a connection between knowledge and reasoning. During this phase, the provider must pause and step back to look at the "big picture" by asking the following questions to ensure there was no breakdown in the diagnostic process: 1) Was the patient involved in the diagnostic process? 2) Were the medical history and physical examination obtained and are they complete? 3) Was diagnostic testing ordered and results reviewed in relation to the rule out diagnoses, including alternative and atypical medical conditions? 4) Were differential diagnosis formulated and prioritized according to life-threatening conditions? 5) Were any diagnostic decisions made based on cognitive biases? 6) Were all of the resources in the DTK utilized including confirming the accuracy of the final diagnosis(es) with the Safer Dx Instrument? and 7) Were follow-up appointment made to check in with the patient for continued monitoring of their condition. Following up with a patient is an essential step in detecting diagnostic errors (IOM, 2015). Meta-Reasoning is the phase where the providers identify limitations or inconsistencies in the diagnostic process and take necessary corrective actions, such as consultation with supervisory physicians or refer patients to appropriate specialists if patient's complaints are outside of provider's scope of practice (Higgs et al., 2008; Hoades & Jenson, 2015)). If the providers fail to complete any of these processes, a breakdown in the diagnostic

process has occurred, and the providers will need to re-start at phase one. At this point, a diagnostic team may be utilized to support the NP in the diagnostic process.

**Reflection Check Points: External Factors/Assumptions = Willingness to Reflect**

Each phase of the Logic Model is cross-walked with a component behavior of the Reflective Practice Model. The synthesis of the two models occurs with the addition of an active reflective behavior at the end of each Phase. The assumptions and external factors related to establishing a diagnosis demonstrates a provider's "willingness to reflect." Willingness to reflect is the beginning phase of critical reasoning and it is a key element to the patient and provider's encounters. Reflection is essential to the information gathering and data synthesis of the diagnostic process. Essentially, reflection enables providers to identify errors, inconsistencies, and limitations such as recognizing when referrals to a specialist are required. More importantly, it allows providers to recognize when knowledge is substandard and additional learning is required (Higgs et al., 2008). Failing to reflect or not be open to reflection will lead to an established routine that an NP may unintentionally follow. The established routine leads to clinical decisions that are based on old habits and biases. Willingness to reflect is essential to a provider's ability to evaluate and synthesize new clinical presentations (Higgs et al., 2008). Hence, it is a critical phase of the reflective process.

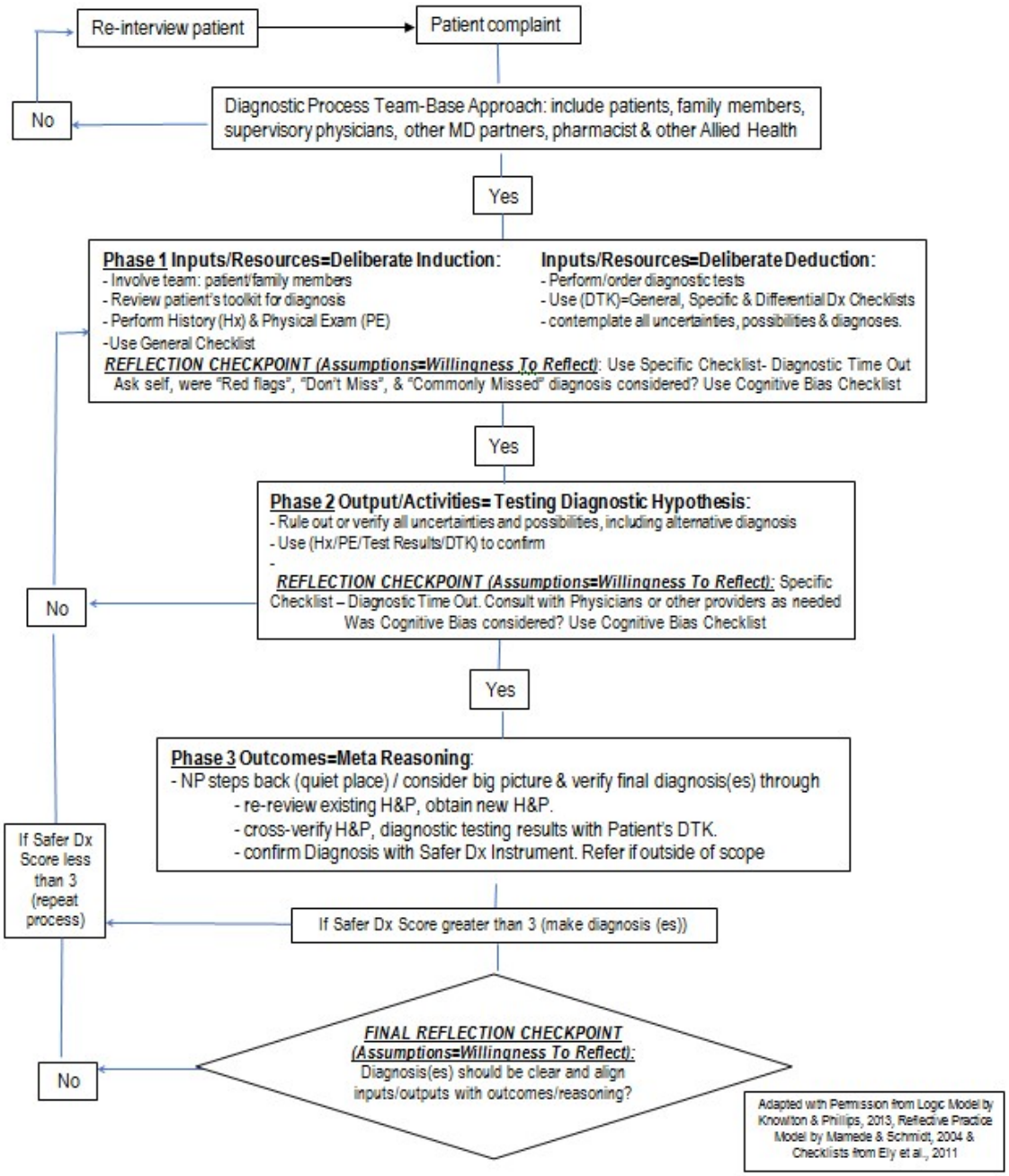
**Content Expert Review of Guideline**

The following content experts were consulted and provided review and critique concerning the development of this EBD guideline. Mark L. Graber, MD, FACP is a Senior Fellow at Research Triangle Institute International, Professor Emeritus of Medicine at Stony Brook University, New York and President of the Society to Improve Diagnosis in Medicine. Dr. Graber is a national leader in the field of patient safety who originated Patient Safety Awareness Week in 2002, an event now recognized internationally. He is also a pioneer in efforts to address diagnostic errors in medicine. In 2008, he originated the Diagnostic Error in Medicine conference series; in 2011, he founded the Society to Improve Diagnosis in Medicine; and in 2014, he launched a new journal called DIAGNOSIS which is devoted to improving the quality and safety of diagnosis, and reducing diagnostic error. Dr. Graber is the 2014 recipient of the John M. Eisenberg Award from The Joint Commission and the National Quality Forum, recognizing individual achievements in advancing patient safety. Dr. Graber is nationally known and has over 200 peer-reviewed publications in all aspects of diagnostic errors.

John Ely, MD is well known among the experts in the field of diagnostic errors and preventive measures to enhance diagnostic accuracy through the implementation of checklists. Dr. Ely has extensive publications in all aspects of diagnostic errors, including Commonly Overlooked Diagnoses and How Not to Miss Them to Checklists to Reduce Diagnostic Errors. Dr. Ely has authored over 50 peer-reviewed publications on all subjects related to diagnostic errors. In fact, Dr. Graber and Dr. Ely have both authored over 250 peer-reviewed publications on diagnostic errors, types, and origins of diagnostic errors in primary care settings and strategies to reduce medical errors. Also, Dr. Graber and Dr. Ely are the authors of the Checklists to Reduce Diagnostic Errors and Checklists to Prevent Diagnostic Errors: A Pilot Randomized Controlled Trial. They

have generously given permission for the utilization of the diagnostic checklists to be integrated as part of the Evidence-Based Diagnostic Guideline herein.

Integrated Diagnostic Practice Guideline
Logic and Reflective Practice Algorithm
DEVELOPMENT OF INTEGRATED MODEL



Integrated Diagnostic Practice Guideline

DEVELOPMENT OF INTEGRATED MODEL

**SUMMARY OF DIAGNOSTIC TOOL KIT** – The DTK consists of resources that will aid providers in the diagnostic process. The DTK resources consist of General Checklist, Specific Checklist, Differential Diagnosis Checklist, Cognitive Bias Checklist, and Safer Dx Instrument. All the General, Specific, and Differential Checklists below are utilized and listed with permissions from Dr. Mark Graber and Dr. John Ely. The General Checklist consists of general information that providers should consider during the diagnostic process. The Specific Checklists are essential elements to consider when a focused exam is performed. The top ten differential diagnoses are the most common conditions according to the National Ambulatory Medical Care survey 2010. The conditions listed are not exhaustive. The Differential Diagnosis Checklist assists providers to contemplate and evaluate patients from a broad and comprehensive standpoint in order to consider all potential possibilities. The Cognitive Bias Checklist is a list of the commonly known biases that providers may engage in during the information gathering and synthesizing of information phase of the diagnostic process. The last diagnostic checklist is the Safer Dx Instrument, which is the final checklist that will help providers verify and confirm the likelihood of diagnostic accuracy. These checklists below are listed in the appendix.

1. General Checklist
2. Specific Checklist
3. Differential Diagnosis Checklists
4. Cognitive Bias Checklist
5. Safer Dx Instrument

Additional checklists are available at the following link:
http://pie.med.utoronto.ca/DC/DC_content/DC_checklist.html

# APPENDIX V

## SERVE AS CONTENT EXPERT – DR. MARK GRABER

**Mark Graber** <graber.mark@gmail.com>
to me, john-ely

Happy to serve as a 'content expert', Christine. CV and biosketch attached.
Mark

**From:** Christine Taheran <mydnp@csu.fullerton.edu>
**Date:** Tuesday, April 24, 2018 at 10:35 AM
**To:** Mark Graber <graber.mark@gmail.com>
**Cc:** John Ely <john-ely@uiowa.edu>
**Subject:** Re: [External] Permission to utilize and adapt Checklists in DNP Project

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...

...

SOCIETY to IMPROVE DIAGNOSIS in MEDICINE

...

**2 Attachments**

W Biosketch - Grab...


W RTI CV - Aug 201...

# APPENDIX W

## SERVE AS CONTENT EXPERT – DR. JOHN ELY

**Ely, John** <john-ely@uiowa.edu>
to me

Christine,

Happy to serve as content expert. I'm retired and have lots of other irons in the fire so time will be limited but I'll do my best. I'll send CV and bio with different email.

John Ely

**From:** Christine Taheran [mailto:mydnp@csu.fullerton.edu]
**Sent:** Tuesday, April 24, 2018 12:35 PM
**To:** Mark Graber
**Cc:** Ely, John
**Subject:** Re: [External] Permission to utilize and adapt Checklists in DNP Project

**Christine Taheran** <mydnp@csu.fullerton.edu>
to John

Dr. Ely,

Thank you very much! It is such a great honor to have you as the content expert for my DNP project!!!!

I will keep you posted on my progress.

Best Regards,
Christine

## APPENDIX X

## IRB APPROVAL LETTER

# Office Memorandum

| | |
|---|---|
| DATE: | September 24, 2018 |
| TO: | Glenn Raup, Ph D |
| FROM: | California State University, Los Angeles (Cal State LA) IRB |
| PROJECT TITLE: | [1293395-1] Reducing Nurse Practitioner Medical Errors: An EBP Guideline with Reflective Practice Algorithm |
| REFERENCE #: | 17-246X |
| SUBMISSION TYPE: | New Project |
| ACTION: | DETERMINATION OF EXEMPT STATUS |
| DECISION DATE: | September 24, 2018 |
| REVIEW CATEGORY: | Exemption category # *4* |

Thank you for your submission of New Project materials for this project. The California State University, Los Angeles (Cal State LA) IRB has determined that this project is EXEMPT FROM IRB REVIEW according to federal regulations.

We will retain a copy of this correspondence within our records.

IF ANY CHANGES ARE MADE TO THE METHODS AND PROCEDURES DESCRIBED IN THIS PROTOCOL, YOU MUST SUBMIT ANOTHER APPLICATION SO THAT THE PROJECT MAY BE RE-EVALUATED FOR EXEMPTION FROM IRB REVIEW.

If you have any questions, please contact Elia Amaro at irb@calstatela.edu or irb@calstatela.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within California State University, Los Angeles (Cal State LA) IRB's records.

# APPENDIX Y

## APPROVAL EMAIL AND LETTER CANP INLAND EMPIRE CHAPTER

Titan Apps

## DNP Project

**Christine Taheran <mydnp@csu.fullerton.edu>**

**Cynthia Jovanov** <jovanovc@me.com> Thu, Apr 19, 2018 at 2:00 PM To: Christine Taheran <mydnp@csu.fullerton.edu>
Cc: Cynthia Jovanov <jovanovc@me.com>

Christine,

I expedited the decision to be made in 24 hours. The CANP Inland Empire Board majority approves your project. We are excited and in full support. Please let me know whatever we can do to support you in this endeavor.

Respectfully,
Cynthia Jovano

MSN, RNFA, CCRN, CNS, ACNP-BC, FNP-BC, MBA CANP Inland Empire Chapter President

CANP CALIFORNIA ASSOCIATION FOR NURSE PRACTITIONERS Inland Empire Chapter

**APPROVAL LETTER CANP INLAND EMPIRE CHAPTER**

April 19, 2018

Dear CSULA and IRB,

The CANP Inland Empire Board fully approves and support Ms. Christine Taheran's Doctor of Nursing Practice (DNP) project. The Board understands that as part of the DNP project, Ms. Taheran will provide the Failure to Diagnose Educational in-service to the CANP Inland Empire NP members and she will be assessing the impact of the education. Before the in-service, the CANP will send an invitation to all nurse practitioner members to invite them to participate in the in-service. The participation of the in-service will be voluntarily, and informed consent will be obtained. Participants may withdraw from the participating with the project at any time without negative consequences. On the day of the educational in-service, the following assessments will be given to participants to complete:

- Demographic and practice setting assessment
- Pre-post-test to assess knowledge
- Intent to change practice assessment

We understand that the Institutional Review Board at the California's State University of Los Angeles requires that the privacy of the participants be protected at all times. We understand the data will be de-identified and participants will be asked not to include their names. We understand that Ms. Taheran will store the data on a secured and password-protected computer. She will be the only one to have access to this secured computer. She will be completing her analysis in collaboration with her Team Leader Dr. Glenn Raup, faculty instructor, and supporting statistician.

The CANP Boards understand the significance of this DNP project is threefold: 1) It contributes to the scientific knowledge base in the field of nursing practice, 2) it brings the attention to the nurse practitioner of the problem related to failure to diagnose medical error and 3) it provides the education necessary to increase awareness of preventable medical errors.

In conclusion, the CANP Inland Empire Chapter are excited and in full support of Ms. Taheran's DNP project, including implementation of the educational in-service, evaluation and gathering of data from the stated tests and assessments.

Sincerely yours,

Cynthia Jovanov, MSN, CCRN, RNFA, CNS, ACNP- BC, FNP-BC,

CANP CALIFORNIA ASSOCIATION FOR NURSE PRACTITIONERS Inland Empire Chapter

MBA CANP Inland Empire Chapter

President

## APPENDIX Z

## APPROVAL EMAIL AND LETTER CANP SAN DIEGO CENTRAL

Approval Email

**Christine Taheran**
**<mydnp@csu.fullerton.edu>**

Titan Apps

### In-Service training to NPs on Failure to Diagnose Medical Error and How to minimize Medical Malpractice Risks

**Andy White** <ajwhite@sandiego.edu> Sun, Apr 15, 2018 at 4:44 PM To: Christine Taheran <mydnp@csu.fullerton.edu>
Cc: amekhed@gmail.com, cothomps2@gmail.com

Hi Christine,
Yes, you have my approval. There is a restaurant located In The Hillcrest area called Arrivederci that you may find suitable for the meeting. They also may have a private room available for use. As The time gets closer (60 days) please let us know-so we can file paperwork for CEU credits.

Respectfully,
Andrew White DNP, FNP-C, PPCNP-BC
Adjunct Clinical Faculty Han School of Nursing and Health Science
Alcala Park San Diego, CA. 92110

# APPROVAL LETTER FROM CANP SAN DIEGO CENTRAL

5/2/18

Dear CSULA and IRB

The CANP Central San Diego Chapter (CANP) fully approved for Ms. Taheran to conduct the following implementations for her Doctorate of Nursing Practice (DNP) project before the nurse practitioner members:

- Provide failure to diagnose educational in-service
- Administer demographic and practice setting assessments before in-service
- Administer pre-post-test to assess knowledge before and after in-service
- Administer intent to change practice assessment after in-service

The CANP understands that the above assessments will be collected, analyzed, and may be published. The result may also be presented at professional conferences. Informed consent will be obtained from the participants and participants may withdrawal from the participation at anytime without any negative consequences. All information provided will be kept in the utmost confidentiality. The names of the participants will not appear in any project or publications. Participant responses will be reported with no identifying features as to the individual. Following data compilation, analysis and interpretation, all data collected during the process of the project will be destroyed.

The CANP believes Ms. Taheran's DNP project will contribute to the scientific knowledge in the field of nursing practice, brings attention to the nurse practitioner of the problem related to failure to diagnose the medical error, and provides the education necessary to increase the awareness of preventable medical error.

As such, the CANP Central San Diego Chapter (CANP) is excited and in full support of Ms. Taheran's DNP project and will assist with the implementations, including providing a forum for the educational in-service before the nurse practitioner members and gathering of data as indicated above for her DNP project.

Sincerely,

Dr. Andrew White

President of CANP San Diego Chapter

# APPENDIX AA

## EMPLOYMENT SUPPORT LETTER

Medical Office

4318 Main Ave, Suite B

Baldwin Park, CA. 91706

May 5, 2018

To Whom it May Concern:

Christine Taheran is an employee in our medical office, working as a nurse practitioner. This letter is to express our support for Christine Taheran on her Failure to Diagnose Educational Guideline DNP Project.

Due to the small nature of our clinic, Ms. Taheran is unable to obtain enough samples needed for her DNP project. We understand that to ensure adequate participants and data collection, Ms. Taheran will be providing the educational in-services to the CANP members. Through CANP and its members, she will be obtaining all the necessary data needed to complete her DNP project.

We fully support her worthwhile and exciting project.

Sincerely,

Marion Ejan, RN

Nurse Manager

818-8578785

# APPENDIX AB

## TABLE OF EVIDENCE

*Summary of Studies Including Contributing Factors to Diagnostic Errors and Strategies to Reduce Them*

| Purpose/Author | Method/Study Design | Sample & Setting | Measurements & Results | Author Conclusion/Limitations |
|---|---|---|---|---|
| Examine whether time pressure condition have effect on diagnostic accuracy (Al Qahtani et al., 2016) | Random Controlled Experiment:<br>Two ground – randomly assigned:<br>1.time-pressure condition<br>2.control condition w/o time pressure<br><br>IV-in time pressure cond. MDs rec'ed info they running behind schedule<br><br>Response time recorded & dx accuracy scored | 23 senior internal medicine residents from 3 hosp. in Saudi Arabia<br><br>-Dx 8 cases on time pressure for control group, & w/o time pressure for non-control group | Measurement: Data analyzed using SPSS version 21 & one-way ANOVA<br><br>Results: Participants of 23 in the fast pace clinical environment spend less than diagnosing cases than 19 control participants (P< 0.001)<br><br>Participants who were under time limits had decrease diagnostic accuracy compared to participants who did not.<br>Part. under time pressure had a ↓ dx. accuracy (P = .012)<br><br>MDs evaluating medical conditions under fast-paced clinical setting experience 37% more medical errors compare to control group of MDs who did not work under fast-paced environment. | Dual-process theory, w/ less time,<br>MDs rely intuitive (system 1) process and less on complex analytical (system 2) process because intuitive process is fast and effortless. However intuitive process is more prone to diagnostic errors. |
| Examine diagnostic errors & decision making processes of GP/PCPs (Goyder et al., 2015) | Qual. Study, used opened ended questions w/out judgement<br>-used datasets of 36 semi-structured interview consisted of questions re: | Interv. Conducted in routine PC setting<br>-Interv. Conducted betw. 2010 & 2011 | Measurements: Descriptive data analysis.<br>-interviews recorded transcribed verbatim, analyzed, & grouped into theme. Quality, rigour, themes confirmed among all authors. Interviews | CFs to DEs:<br>1.failed to consider Diff. DX. Fail to reflect<br>2.failed to recognize "red flags" |

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| | GP exp. Of dx &DEs or almost missed<br>-interviews audio-recorded | -interview conducted using 2 datasets:<br>1.GPs describe 2 new pts. during most recent OOH shift (one diff cases & one easy case)<br>2.GPS shared exp. Of DEs from past exp:45 cases DEs or near misses | coded by Version 10<br>Results: GPs learning points were identified:L<br>1. Pattern Recognition: "think in pattern rather than in dx". DEs occurred when symptoms did know fit recognizable pattern<br>2. Restricted rule out "ruling out the worst case scenario" was connected w/ avoiding some DEs. Some GPs thought this more important than correct dx.<br>3. Sense of unease: GP expressed something "seriously wrong" w/ pt. but unable to reasonably/logically explain. Some DE could be mitigated/avoid if GP listened to sense of unease | Strength: when possible asked to describe recent case-so fresh memory. But difficult cases, even if not recent. Limitations: reflection may include bias |
| Replicate UK study findings by examine if early support associated with higher accuracy diagnose then late support (Kostopoulou, et al.2015) | Randomized controlled trial<br>-three groups: Control group, early support group and late support group. | Participants of 300 invited to take part, 257 responded<br>-150 Greek (50%) family MDs participated<br>-data collect from 2/2012to 12/2012<br>-median participants were 4 years in family practice | Measurement: Reviewers blinded MD participants, independently determined presence or absence of DEs in selected triggered & controlled visits.<br>Results: Compa. narrative review of 41 studies found 3 main effective strategies: 1) increase knowledge/expertise, improve clinical rasoning get help from colleages, experts and tools<br>-Early support(control group) group more correct than control (P = 0.002)<br>-with late support group, gather info, gave dx, later received a list of probable dx to consider (late support), more accurate than control (P = 0.008. changes only occ. 4%., from incorrect to correct.<br>-mean dx. accuracy for control group 0.60 ((95%)<br>-No signif diff. in exp. Of MD betw. Groups (P = 0.27) | Consistent with prior study, in UK, given early support of suggestive dx to consider before MDs gather info was assoc. with more accurate DXs.<br>-with early support of pot. dx. to consider, MD able to signif. more acc. than unaided control group.<br>-Contrary, with late support when list of dx. given to MD to consider, they rarely change their mind |

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| | | | -rec. syst. ways of gen. diff. dx. to aid safe decision making, such as present dx list to MD early in visit encounter | |
| Examine studies that had evaluated interventions to improve analytical & non-analytical reasoning among medical traineeds & MDs to ascertain the effectiveness (Lambe et al. 2016) | Randomized controlled trials, quasi-randomized studies. Systematic review of 5 databaes were assess (Medline, PsycInfo, Embase, ERIC and Cochrane DB of Controlled trials)<br>-guided by PRISMA protocols for syst. Reviews<br>-Education & workplace strategies, content knowledge or expt. Provide external assist. From support tools.<br>Var. setting, country, yr. of data/pub, study design, part char. Size, f/u, findings | Selection of studies – reviewed indep. By 2 authors w/ manual searches of journals & reference lists, abstracts of articles flagged as potential<br>Inclu: 28 studies: 9 studies w/ MS, 10 studies w/ residents, 3 w/ MDs only, 4 MS & resident, 2 MS, Resid. & MDs, 7 studes in US, 10 Canada | Measurement: Utilized PRISMA protocols for systematic reviews<br>Results: Participants consisted of 2,732 that took part across 28 studies.<br>Interventions:<br>-4 studies impact of checklist intervention, 2 used general dx checklist, 1 used debasing checklist & diff. dx. checklist, 3 examined impact of utilization of checklist on dx accuracy in clinical scenarios,<br>Cognitive forcing strategies:<br>3 studies examined impact of interv. Using cognitive Forcing strategies, 2 instructed part. To cons. alter. DX, 1 instruc. To recon DX after misleading detail.<br>Guided reflection:<br>5 studies examined impact of interv. Instruct part. To Dx cases thru guided, structured reflection process, compared w/ instruction. To Dx. case quickly.<br>All studies reveal impact of guided reflection on dx. accuracy. | EHR facilitated screening could be helpful for<br>28 studies included under 5 categories recommended/concluded:<br>1) Guided reflective checklist practice<br>2) Five studies, cognitive forcing strategies enhanced correctness & self-assurance and judgments.<br>3) Cognitive Interv. rec. to medical education |
| Examine whether there are specific communication (com) behaviors assoc. w/ malpractice hx in PCPs & surgeons (Levinson et al., 1997) | Comparison of commication behaviors of “claims” vs. “no-claims MDs<br>-utilizing audiotapes to record conversation of 10 usual, routine clinical visits per MD.<br>MDs classified into “no claims” or “claims”, | 124 physician offices in Oregon & Colorado,<br>59 PCP (general practitioners, internal medicine, and family providers) | Measurement: Audiotape analysis utilizing Roter Interact Analysis System<br>Results: PCP w/ no-claims<br>- involve their patients in their care, including education and gave the patients the sense of orientation and directions with their visits, including the orientation, flow and length of their visit. | PCPs w/o prior claims spent more time w/ pts. and com. w/ pts. more compare w/ PCPs w/ prior claims |

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| | which based on insurance company records | 65 general & ortho doctors who also surgeons | -in addition to education, orientation of the patient care, these PCPs used sense a humor and laugh with their patients.<br>-also, PCPs used education to facilitate more questions, check patient's understanding and assess patients' understanding.<br>- No claims providers spent more time w/ pts. (18.3 vs. 15.0). Length of time spent with pts. independent predictor of claim results | |
| Examine whether pt. perceive longer time visit w/ internist increase satisfaction (Lin et al., 2001) | Prospective survey of 1486 consecutively outpt. Visits to 16 PCPs in primary care clinic.<br><br>Patients' questions: demo, health status, perception of time spent before & after outp. Visits, whether MD appeared rush, & visit satisfaction, whether they felt rushed. | Out of 1486 : 51% pts. women, 51% aged 40-59, 24% younger than 40 yrs. 25% 60 or older. Consecutively outpt. Visits to 16 PCPs in primary care clinic. | Measurement: Statistical analysis performed using SPSS-PC version<br>2 self administered pt. questionnaires<br>Results: Pt. who spent extra time than anticipated w/ PCP was more content with visits. Pts. who have more health concerns and experience lower self-perceived health condition anticipated to spend more time with doctors.<br>PCPs experience being rushed in 10% of visits. Pts. are content when their visits were not rushed and when doctors take their time in evaluating their care without being rushed | Perceived cost containment by stakeholders and leaders include increasing PCP workloads, which results in doctors spending less time with pts.<br>-Contrary, spending more less than w/ pts. results in less pts. satisfactions .<br>-more time spent with patient, happier the patients and quality of care is improved.<br>-pts. who are more ill, seeking care with specialists expected to spend longer time with doctors. |
| Examined if salient distracting features (SDFs) assoc. w/ certain DZ mislead/distract clinical reasoning leading to errors (Mamede et al., 2014) | Qual. Study, 72 internal residence dx 1 cases (6 easy, 6 complex) in 3 different forms: w/o SDF, w/SDF in beginning & w/SDF at end. DV – each part. Solve 2 simple cases & 2 complex cases. IV-SDFs | 2012 at Erasmus Med. Centre, Rotterdam<br>-72 internal Medicine residents | Measurement: Descriptive analysis utilizing Newcastle- Ottawa scale<br>Results: Noted SDF in initial of difficult case caused errors more when compared to cases both w/cases w/out SDF $P<0.001$<br>When SDFs introduced in beginning of case increase DEs. However 28%% mistakes were attributed to presence of early SDFs, but 72% DEs unrelated to SDFs. Authors speculated due to early SDF lead to uncertainty, perplexity, longer evaluation times.<br>SDFs had effect no DE when introduced at end of cases. SDFs can decrease DEs in | SDFs early in cases are important source of DEs. PCPs should be cognizant of this to prevent DE. This is result from "premature closure" by MDs terminate reasoning about cases prematurely b/c SDF difficult to overcome. |

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| | | | complex if SDFs are encountered early in case description | |
| Examine literatures to identify common biases, influence of bias on Dx accuracy/tx plans, & assess bias on pt. outcomes. (Saposnik et al., 2016) | Retro lit. (qualitative synthesis) review of 20 studies, 6810 MDs. Cognitive bias such as anchoring, over confidence or personality trait shape MDs evaluation. | Articles on cognitive biases from 1980 to 5/2015, inclusion: 1 cogn. factor case or real scenarios, identified 5963 studies:<br>-out of 114 publications, 20 studies met inclusion, consisted of 6810 physicians | Measurement: Descriptive analysis utilizing Newcastle- Ottawa scale<br>Results: Over confidence, lower tolerance to risk, anchoring effect, availability biases associated with DE in 36.5 – 77%, of case scenarios. 5 out of 7, which was 71.4% of studies indicated association of cogn. and management errors. Of 2 studies (10%) outcome of cogn. biases, one showed tolerance to ambiguity assoc. w/ increase med. compl. (p = .004). Cog. Biases common in all studies. | Over confidence, anchoring effect, premature closure & avail. Bias, tolerance to risk may be connected with DEs or suboptimal evaluation/treatment<br>Strategies:<br>1). Reflective reasoning lessen impact of of cognitive biases by improving dx accuracy<br>2). Utilization of tools such as checklists may overcome cognitive biases |
| Examined DE among PCP in OP settings on barriers to timely diagnose and perceptions of diagnostic difficulty (Sarkar et al., 2012) | Qual. descriptive analysis. Survey PCPs across 10 geographic dispersed states questions to assess:<br>-clinical knowledge strategies<br>-predictors of diagnostic difficulty | Total1817<br>PCPs surveyed<br>-1054 (58%0 answered; 848 (80%) PCP practiced in OP (Inclusion sample)<br>-offered $10 incentive to participants | Measurements: Tabulated data Utilized Cronback measure to determine reliability. 3 factors:<br>1).Time for evaluations, 2). Referral resources comrn. betw.<br>3).PCP, delays in referrals, pt. chara.<br>Results: Challenge to Dx<br>- knowledge deficit (19.9%) was most prevalent cognitive factor<br>-5% noted pts. difficult to dx, but more exp. PCS repot1ed less dx diff.<br>-848 respondents, 50% reported >5% cases diff. to dx., 198 of | Cog. contrib. factors<br>- knowledge base inadequate/defect (50%), fault detection or perception (32%)<br>-failure to order or flu on test (24%)<br>-overestimate or underestimate usefulness or salience of finding (23%)<br>-related to referral |

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| | | | 453 reported knowledge/judgment issues contri to miss/delayed DX due to cognitive factors<br>-Associated w/ diff. DX: info availtime to review it<br>-Recom. for improve – common include scheduling issues (workload size, non-scheduled visits )<br>-intervention to reduce knowledge gaps and time to process diagnostic info, may reduce diagnostic diff. | issues: long wait for pro. & consult (40%), lack of com. betw. PCP & spec. 11%<br>-Over-schedule pts. insufficient time w/ pt., inadequate time compare to patients/providers (31%) |
| Examine patient safety by evaluating types, causes, & prevention of missed or delayed dx (Schiff et al., 2009) | Qualitative study, thru descriptive analysis<br>-surveyed participants (MDs) during 20 grand rounds surveyed participants to assess perceived cases<br>-final dx, CFs, impact, outcome, freq. demo, specialty, yrs. Exp. Of MDs | Providers (310) from 22 institutions<br>-total of 669 cases reported<br>-583 DE cases identified as DE, 86 excluded | Measurement: Data entered Microsoft to ensure anonymity, X were code, group, descriptive stat. analyzed.<br>-Investigators & 2 MDs investigators<br>-Used taxonomy tool to classify type of error in diagnostic process, 2 stage process class<br>Results: Out of 583 Des: 162 Des (28%) rated major, 241 DE (41%) as mod. & 180 (31%) as minor. Most common missed or delayed dx: failure to order, report, & F/U lab results = 44%. Most Prevalent -FTD (failure to consider dx = 32%). Hx taking (10%), PE (10%, & referral or consult errors & delays (3%) | FTD findings consistent with previous large malpractice claims with cancer being leading category, f/u by cancer, f/u by PE, ACS, stroke, & infection<br>Failure to order lab/rad test, interp, & F/U<br>-less error in assess,<br>-Error in asses state, referred to as cognitive error, failed to consider diff. dx (hypothesis generation)<br>-DE by failed to recognize severity pts. illness.<br>-failed to order tx. b/c failed to Dx due to bias.<br>Limitation: rely on provider's memory |
| Examine & identify DEs in primary care using electronic screening algorithm (Singh et al., 2007) | Utilized electronic screening algorithm to screen med. records of pt. at one hospital, to screen for:<br>1.Primary care visit | PC clinics VA in Houston, Tex from 8/01/2004 – 9/30/2005<br>-clinic consists of | Measurement: Data analysis used Excel, Microsoft Corp. and SAS software., variables usmg parametric (x2 test, Fisher exact test, Kruskall-Wallis test) Analyze accuracy of dx. by utilizing repeated ANOVA | PCPs/under-staff<br>9.4% of return visits in screen I and 24.5% or return visits in screen 2 were prearranged<br>Limitation 10-day cutoff would typically aid only in the detection of those primary care |

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| | followed by hospitalization in next 10 days or Or 2. followed by 1 or more primary care, urgent care, or emergency department visits within 10 days | rotating group of 130 internal medicine residents who see pts. in scheduled PC f/u cline visits & walk in unscheduled clinic visits. 15,580 PC visits from 211 medical records, which 139 met criteria review | Results: 15,580 PC visits from 211 medical records, which 139 met criteria review. Screen 2 was applied to 5267 PC visits, 199 ramdom sample contra visits was chosen for review. Screen 1, 15.580 PC visits, 211 medical records, which 39 met critieria, Positive value for screen, P = 0.005. Screen 2, 5267 PC visits, of which 17 confirmed DEs & 13 other tx. Errors, 8 were DEs, and 5 clinical management errors, consensus cold not be reach in 2 cases (1 in each of the 2 screens). No errors in Dx were discovered at phone F/U of 11 pt. | that manifest clinically within a short duration |

# APPENDIX AC

# TABLE OF EVIDENCE

*Summary of Reflective Checklist Studies*

| Purpose/Author | Method/Study Design | Sample & Setting | Measurements & Results | Author Conclusion/Limitations |
|---|---|---|---|---|
| Examine whether using will help prevent premature closure and reduce DE (Ely & Graber, 2015) | Controlled RTC to usual care vs. dx CL.<br>ID- CL given to MDs to read out DD CL Checklists<br>Commonly missed dx "Don't Miss" Dx | ER setting:<br>-Usual care vs. Diag. Checklist (CL)<br>-after Hx/PE, DD CL read out<br>1 mo. Post visit, investigator reviewed med. record, F/U visit & hosp. review to detect any evid. Of missed or delayed dx., also call pt. to ask re: med. visit, evid. Of disp. w/ initial dx. (pt. aware of study) | Measurements: Descriptive analysis: used cluster-level analysis, unit analysis, outcome summary for each MD. b/c small # of MDs, used t-test to evaluate error. Analysis w/ Stata Version 12<br>Results: 17 DEs. Mean Error rate among the 17 MDs using CLs the diagnostic error rates was not statistical significance compared to MDs who did not use the CLs. ER MDs in CL group had lower mean error rate than ER MDs in usual care group ((19.1% vs. 45.0%; $p < 0.04$). CL MD considered more Dx than usual care MD during pt. encounters ( $p < 0.001$). Strength of study is RCT, inclusion of real pts., not simulated pts. | CL did not improve the DE rate in this study. The CL review only took < 2 min. CL did not order testing not required or guide MD away from the right initial dx<br>Limitation:<br>-The study sample size was not sufficient to find importance Diff. betw. CL and usual care.<br>-The appropriate Powered Sample needed to be 230 pts. in each group, with the assumption of 20% error rate in the control group |
| Examine whether differential DX CL helpful in prevention of DEs (Graber et al. 2014) | Qualitative study<br>-assess to assess resources pre/post checklist use.<br>-general CL<br>-sympt. Specific CL<br>CL develope:<br>-version 1 used published CL, conducted | 16 recruited MDs, 15 ER MDs (participated) in large academic centers,<br>-MDs used general CL & symptom-specific CLs for 2 mos. | Measurements: Rapid cycle design utilized to design/refine general checklist, with input with MD users. Datum were compared by $\chi 2$ analysis<br>Results: General and the symptom-specific CL were concluded to be useful. Specific CLs were more preferred over general CLs<br>Both junior and senior MDs use general and specific CLs. | CLs for Dx helpful for diff. dx. poss. & have potential to ↓DEs. Although researchers enc. using CLs in collaboration w/ pts. to maximize benefits, none of participate did. Helpfulness of general CL:<br>-teaching tools<br>-time to pause and reflect. |

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| | interview w/ 7 subjects for input for ideal general CL.<br>-CL verified w/ lit/experts | -Chart review, to eval trends in using CL (randomly select 186 records, 104 chars were seen by MDs used CL, 82 charts used CL for 3 mos. interview w/ parts. feasibility, usability, usefulness, fit workflow<br>14 PCPs, 103 pts. | Senior MDs favored the specific CLs ($P < 0.001$). CLs helpful with differential diagnosis and possibilities, helpful in decrease diagnostic errors. Themes identified:<br>-CL usage helpful<br>-CL help prompt poss. miss DX<br>-Cl helpful as teaching instruments<br>-CL not used together with or without pts.<br>-General and specific Cl useful, more like specific CL (no report using CL promote incorrect DX) | -useful in any clinical settings<br>-use with pts. to include them in plan of care.<br><br>CL not a protocol, but general CL may cue MDs as reminder |
| Examine whether if using checklist improve cardiac diagnostic accuracy (Sibbald, de Bruin, & Cavalcanti, 2013) | Comparative cohort of residents, RCT study (half part. allowed access to simulator station & half were not allowed access to stimulator while using checklist) Part. rate cognitive load each step:<br>-pre-checklist dx<br>--checklist use<br>-post checklist dx<br>simulator. Was randomly set to one of 6 diff. dxs:<br>-all dx had single murmur, mult. Related findings normal, abn. heart, lung sounds, carotid pulsation, Jugular, Ven., DX include MS, MR, ASD, MVP, A. Sc, AS | Med. residents, 5-8 yrs. Physical exam exp.<br>-Cal. Min. sample of 156 need to detect a 20% diff. in dx accuracy assuming power of 80% & $\alpha$ of 0.05. Simulator was randomly set to one of 6 diff. dxs.<br>-checklist developed from two textbooks, presented via iPad | Measurements: Dx cat. Into correct or incorrect., calculated into point, divided into items, distributed date in median, ranges and means - accuracy pre-checklist & post checklist was compared using McNemar exact test<br>Results: By confirming with CL, diagnostic accuracy increased. 88 Residents diagnostic accuracy increased from 46% to 51% after confirming with CL. The key conclusions of key evaluations were not affected with re-examination of simulator. | Utilization of CL to confirm diagnoses increase diagnostic accuracy but did not increase cognitive load. Simulator replicates the heart exam. |

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| Examine if checklists use by expert improve diagnostic decisions (Sibbald, de Bruin & van Merrienboer, 2013) | Quasi-expert. study<br>15 ECGs experts interpret ECGs in 4 diff. cond (IV):<br>-indirect interprete<br>-verify w/o checklist<br>- verify Without checklist;<br>-verify w/ checklist, & interp. Comb. w/ verify w/checklist.<br>DV:<br>-cognitive Load, interp. Time & interp. Length.<br>-comp. of verif. Cond is W & w/o checklist & comp of al 4 conds. | Parts: 15 ECG experts (cardiology fellows w/ 8-11 yrs. Of exp. In ECG (2/2012 & 3/2012) | Measurements: Analysis utilizing SPSS Version 20)<br>-Indep. *t*-test used comp. error detect., interpret. Length, cog. Load & interp. Time betwn. Cond 2 & 3<br>-standard scores created all 4 variables: error correction; cognitive. Load; interp. Time & interpret length<br>Results: Utilizing CL reduces errors.<br>Utilizing CL enable providers to correct more errors when verify cond. w/ checklists and fewer net errors in all conditions w/ CL.<br>CLs were not associated with ↑ cognitive load w/ & and w/o CLs.<br>Utilizing CL required greater interpret/ times and lengths ($p < 0.01$).<br>Experts indicated the awareness of CL advantage, benefits, & informed authors that they routinely used CL-like, & thru CL – find error 1 in 5 in ECG | Experts use<br>CLs during the confirmation stage of<br>dx decisions did not burden cognitive load.<br>-Utilization of checklist reduce diagnostic errors.<br>1.CL assoc. w/ fewer errors<br>2.Verif. tasks assoc. w/ fewer errors comp. w/ interp task<br>3. cognitive load did not differ betw. Conds. W & w/o CL.<br>4.CL associated. w/ greater interpretation. & very. Time<br>5.CL use associated. w/ > cognitive and time efficiency |
| Examine if using differential dx CL & general de-biasing CL on diagnostic performance increase when compare to intuitive diagnosis (Simizu et al. 2013) | Empirical research<br>-conduct diagnostic quiz cases<br>-5 cases: ACS, Sub. Hem., Fitz-Hugh-Curtis, aortic diss. & obturator hernia.<br>-arranged in dx. difficulty | 188 med. stud. in Japan from 8/2011 to 1/2012, during med. conf. divided into 2 groups, assigned 5 cases: Group 1 (91) = Part. to write likely dx by quickly read case scenarios w/ 5 min, then after analyzing, dx GDBC, then diagnosis by DDXC. Group 2(97) provide | Measurements: Utilizing repeating measure of ANOVA -compared the average total scores betw. Intuitive ex, dx by GDBC & dx by DDXC<br>Results: Sign. different between. Groups. Group 1 total scores ($p = 0.01$ by ANOVA) between intuitive (8.25) and DDXC (8.77).<br>Group 2, we noted significant difference of total scores ($P = 0.001$) between intuitive and DDXC, which indicated that critical reasoning by analytical process is more ideal for more complicated cases and the intuitive process is more appropriate for simple cases | Utilization of DDXC increase diagnostic accuracy with complicated cases, not the simple cases. Utilization of the GDBC did not increase diagnostic accuracy. |

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| | | intuitive dx, by DDX, & by GDBC | | |

*Note.* CPA = Note: dx = diagnositic, DX = diagnosis; Dx = diagnose, signif = significance; interv. = intervention, F/U = follow-up; diff = differential, alter = alternative, recon = reconsider, MS = medical student, inclu = inclusion; thru = through, hosp = hospital; assoc. = association, PCP = primary care provider, demo = demonstration, pt. = patient; w = with; w/o = without; ECG Electrocardiogam; DDXC = differential diagnosis checklist; GDBC = general de-biasing checklist; lit = literature; sympt. = symptom; poss. = possible; Recom. = recommendation; stat = static; hx = history; lab = laboratory; rad-radiology; NPDB = National Practitioner Data Bank; Physicians = MDs, Malpractice = MP, Medical = Med., AA = Adverse Actions; ave = average, pay = payment, Ped = pediatric, OB = Obstetric, ER = Emergency; prim. = primary, A = adult, indem = indemnity, fail = failure; Medi = medication, exp. = experience, CE = continue education, EMR = electronic medical records, disc = disclosure, Rev. = review, pract. = practice, ind = individual, meds = medication; ICF = Individual contributing factor, SCFs = system contributory factors, CF = contributing factors, exp. = experienced, org. = organization, # = number, admin = administration, com = communication, atten = attention, negli = negligence, EHR = electronic health record, VA = Veterans Affairs, IPHCS = integrated private health care system, btw = between, P = Potential, comp = compare, w/ = with, w/o = without, DE = Diagnostic Errors, char = characteristics, pneu = pneumonia, CHF = congestive heart failure, ARF = acute renal failure, bd = breakdown, P-P = patient-practitioner, PB = Process Breakdown, freq. frequent, clin. = clinical, enc = encounter, ref. = referral, RT = Related to, hx = history, E = errors, DE = Diagnostic errors, PIAA = Physician Insurers Association of America's, PE = Pulmonary Embolism, MI = Myocardial Infarction, SOB = Shortness of breath, C/O = Complaint of; CL = Checklist; MS = mitral stenosis, MR = Mitral Regurgitation, ASD, Atrial Septal Defect, MVP = Mitral Valve Prolapse, A. Sc = Aortic Sclerosis & AA = Aortic stenosis; cond = condition.