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Diagnostic error in mental health: a review

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ABSTRACT

Diagnostic errors are associated with patient harm and suboptimal outcomes. Despite national scientific efforts to advance definition, measurement and interventions for diagnostic error, diagnosis in mental health is not well represented in this ongoing work. We aimed to summarise the current state of research on diagnostic errors in mental health and identify opportunities to align future research with the emerging science of diagnostic safety. We review conceptual considerations for defining and measuring diagnostic error, the application of these concepts to mental health settings, and the methods and subject matter focus of recent studies of diagnostic error in mental health. We found that diagnostic error is well understood to be a problem in mental healthcare. Although few studies used clear definitions or frameworks for understanding diagnostic error in mental health, several studies of missed, wrong, delayed and disparate diagnosis of common mental disorders have identified various avenues for future research and development. Nevertheless, a lack of clear consensus on how to conceptualise, define and measure errors in diagnosis will pose a barrier to advancement. Further research should focus on identifying preventable missed opportunities in the diagnosis of mental disorders, which may uncover generalisable opportunities for improvement.

INTRODUCTION

Timely and appropriate diagnosis in mental health is an essential first step towards effective treatment. Missed, delayed or wrong diagnosis of mental disorders can lead to poorer patient outcomes and can waste time and resources. For example, delayed diagnosis of bipolar disorder has been linked to more frequent relapse and hospitalisations.[1 2] In a large registry study of over 1000 patients with narcolepsy, over one-quarter of the sample reported having consulted five or more clinicians before receiving the diagnosis.[3] Missed and delayed diagnosis can also result in a lack of functional improvement, delayed remission, and delayed or unnecessary treatments.[4]

Mental disorders are largely clinical diagnoses that seldom have specific objective findings that can be detected through laboratory testing, physical examination or imaging. As such, history taking, behavioural observation and data gathering from collateral sources (eg, family members, teachers) are essential to the diagnosis. Despite the importance of effective data gathering and synthesis, time pressures, competing priorities and various cognitive biases can interfere with this process.[4–6] Validated psychological tests and symptom reporting scales can help with the data gathering process, but these can lead to inaccurate diagnostic impressions if they are interpreted without sufficient context or not followed with an appropriate diagnostic interview.[7 8] Finally, evolving (and in some cases, expanding) diagnostic criteria for mental disorders have prompted concerns that clinicians could inadvertently pathologise normal experiences.[9 10]

Despite these and other concerns about the quality of psychiatric diagnosis, most discussion of diagnostic error in mental health has been disconnected from the broader national conversation on diagnostic error and diagnostic excellence. As a stark example, while the National Academies of Science, Engineering, and Medicine's (NASEM) landmark report *Improving Diagnosis in Health Care*[4] describes mental health diagnosis as 'particularly challenging' (p. 52), there is otherwise little explicit mention of mental health in this 472-page report. In turn, the NASEM report is only sparsely cited in the mental health literature.[11 12] The NASEM report and contemporary research on diagnostic errors has stimulated major private (eg, Moore Foundation) and public (eg, Agency for Healthcare Research and Quality) funding initiatives to study and improve diagnostic safety. Again, however, mental health has been scarcely represented in the various projects funded under these initiatives. This is a significant gap given

the high prevalence of mental disorders in the USA and worldwide.

As definitions and methods for studying diagnostic safety advance, it is important that these concepts can be applied to mental health. In this narrative review, we aim to summarise the current state of research on diagnostic error in mental health and identify opportunities to align future research with the emerging science of diagnostic safety. Specifically, we review (1) how diagnostic error in mental health has been conceptualised and measured; (2) evidence for diagnosis-specific pitfalls in common mental disorders; and (3) evidence to inform interventions to reduce diagnostic errors. Although diagnostic overshadowing (the attribution of symptoms to an existing diagnosis rather than a potential comorbid condition[13]) in people with mental disorders is an important problem,[13–16] this is reviewed elsewhere[17 18] and is outside the scope of this review. We also do not cover the topic of overdiagnosis (when a condition is diagnosed that would not otherwise be consequential to the patient's health or well-being[4 19]), as the term is used inconsistently in this literature and is usually conflated with related concepts such as false positives, overtreatment and misdiagnosis.[20]

CONCEPTUALISING AND MEASURING DIAGNOSTIC ERRORS

Explicit definitions of diagnostic error seldom appear in the mental health literature, making it difficult to compare findings across studies. A definition in a major psychiatry textbook, acknowledging the work of Cullen *et al*,[21] focuses on diagnostic accuracy: 'Diagnostic errors are not only inappropriate psychiatric diagnosis, but also mistaking a physical illness for a psychiatric condition or vice versa.'[22] Similarly, studies of diagnostic error in mental health have implicitly or explicitly conceptualised diagnostic error as a discrepancy between a previously assigned clinical diagnosis (or lack thereof) and subsequent reappraisal. For example, in a youth community mental health sample, Jensen-Doss and colleagues compared clinician-generated diagnoses with the diagnoses generated by team consensus based on a structured diagnostic interview, medical record review and diagnostic impressions from team members. In this study, most discrepancies between clinician and team consensus diagnoses were attributable to missed diagnoses (ie, diagnoses not noted by the original clinician but subsequently assigned by team consensus).[23]

Studies use similar approaches to reappraising prior mental disorder diagnoses with the aid of structured diagnostic interviews such as the Composite International Diagnostic Interview (CIDI),[24–26] Mini Neuropsychiatric Inventory (MINI),[27–32] Structured Clinical Interview for DSM Disorders (SCID),[33–36] or population-specific[37] or disorder-specific[38] interviews. Others report re-review of medical records to confirm diagnostic criteria.[39–41] However, there are several potential pitfalls of using diagnostic reappraisal to identify errors, including hindsight bias, failure to consider the disorder's timing of onset, natural history or circumstances that might have complicated a previous diagnostic evaluation.[42] Moreover, methodological inconsistencies prevent comparisons across studies. For instance, whereas some studies of diagnostic discrepancies use structured interviews and other standardised methods for diagnostic assessment, others have inferred a previously 'missed' diagnosis solely based on a positive screening test without a more thorough assessment of diagnostic criteria.[43–47] Table 1 summarises recent approaches to identifying diagnostic error and recommendations for future studies.

More detailed conceptual and operational definitions for diagnostic errors are needed to measure and learn from these events. The NASEM report defines diagnostic error in terms of not only accuracy but also timeliness and communication: 'the failure to (a) establish an accurate and timely explanation of the patient's health problem(s) or (b) communicate that explanation to the patient.'[4] Other recent definitions emphasise similar concepts and also introduce a component of preventability ('missed opportunities').[48 49] An acceptable or normative diagnostic interval is difficult to specify and must be balanced against unrealistic expectations that could invite hasty or overaggressive pursuit of diagnosis.[42] However, factors that are systematically associated with diagnostic accuracy or delays may point to missed opportunities. Such variation can also be examined in the context of health disparities (table 1).

Importantly, conceptual models for understanding diagnostic error emphasise diagnosis as a process that unfolds within a complex system, sometimes across providers and locations. For example, the diagnostic process model in the NASEM report[4] (figure 1), as well as the related Safer Dx framework,[50] describe five data gathering and interpretation processes: clinical history and interview, physical examination (including observation of appearance and behaviour), referral and consultation, diagnostic testing, and (in the latter) patient-related factors. Identifying process failures[51] (eg, did the clinician gather sufficient information to rule out an alternative diagnosis?), rather than focusing solely on the end result (eg, was the clinician's original diagnosis correct?) enables more precise measurement of errors even when the 'correct' or final diagnosis cannot be confirmed, and allows for targeted improvements in the diagnostic process. Clinic-based studies are needed to better understand clinical reasoning and other diagnostic processes in practice. However, complementary evidence about clinical reasoning comes from vignette-based studies that experimentally manipulate patient characteristics, symptom presentation and specific instructions for diagnostic reasoning.[52–58] In a separate section below,

Table 1 Empirical approaches for studying diagnostic error in mental health

Type of diagnostic error	Description of approach	Example of use of this approach	Recommendations for future studies
Misdiagnosis or wrong diagnosis	Compare recent clinical documentation or clinician-reported diagnosis to the outcome of a confirmatory diagnostic evaluation, often including a semistructured interview to establish diagnostic criteria	In children presenting for intake visits at a community mental health clinic (N=391), missed diagnosis (ie, a diagnosis assigned by an expert consensus team but not by a clinician conducting a separate unstructured intake interview) ranged from 9% (elimination disorders and bipolar/other mood disorders) to 28% (ADHD)[23]	Limit time between initial diagnosis and re-evaluation to confirm the diagnosis, taking into consideration the natural history of the disorder Ensure appropriate training of research interviewers, including calibration of diagnostic decisions with expert clinicians
	Perform a chart review to identify earlier opportunities to make a timely and correct diagnosis	Of 8-year-old children who met case criteria for autism spectrum disorder in a large community surveillance sample (N=572), 42.5% had no previous diagnosis documented in medical or educational records[86]	Use systematic criteria and approach to review records for missed opportunities[11]
	Assess diagnostic impressions of case vignettes depicting a mental disorder	Clinicians were less likely to suspect obsessive compulsive disorder when vignettes depicted 'taboo' obsessional thought content compared with obsessions about contamination or symmetry[52 55 56]	Ensure that vignettes and other simulated clinical encounters are valid and credible
Delayed diagnosis	Identify delay between initial help seeking and final receipt of an accurate diagnosis, as well as factors associated with delay duration	In a study of 924 people with mood disorders, average time between initial diagnosis of depression and subsequent correct diagnosis of bipolar disorder was 5.4 years[25]	Use consistent definitions for milestones in the diagnostic pathway for mental disorders
	Identify factors associated with age at diagnosis of neurodevelopmental disorders of childhood	A review of 42 studies indicated that average age at diagnosis of autism spectrum disorder has decreased over time; age at diagnosis is associated with symptom severity and socioeconomic status[77]	
Diagnostic disparities	Identify variations in diagnostic accuracy or diagnostic delays associated with social determinants of health	Two expert clinicians reviewed medical records along with transcripts of diagnostic interviews for 79 Black and white patients, with ethnic cues removed from all records. Among the patients diagnosed with a mood disorder by the expert clinicians, Black men were more likely than other patients to have received a discrepant diagnosis of a schizophrenia spectrum disorder by a clinician who had interviewed the patient face-to-face[101]	Consider how social determinants may relate to symptom presentation and clinician bias Consider how social determinants are related to differential exposure to risk factors (eg, adverse childhood experiences)

ADHD, attention deficit hyperactivity disorder.

we discuss further details of potential interventions to enhance the diagnostic process.

APPLYING DIAGNOSTIC PROCESS MODELS TO MENTAL HEALTH

While formal concepts and definitions have potential to advance understanding of diagnostic error, it is important to ensure that they reflect the context of mental disorder diagnosis. For instance, while the NASEM model includes the initial steps of experiencing a health problem and engaging with the healthcare system, the model places less emphasis on these initial steps as compared with data gathering. This is an important limitation because patient knowledge and attitudes, stigma and structural barriers play a considerable role in mental healthcare delays.[59–61] A few studies of delayed diagnosis in mental health have defined the diagnostic process in terms of key clinical milestones (eg, first symptoms, first time seeking professional help and time of final, accurate diagnosis), altogether constituting the duration of untreated illness. For example, two studies depicted the evolution of a bipolar disorder diagnosis[62 63] in the form of a graph showing the total diagnostic timeline and the time elapsed between milestones. Other process-oriented models cited in this literature emphasise potential barriers and facilitators to care seeking (eg, Andersen's behavioural model of health services[64 65] and the cascade of care model[66]). To better account for the total delay in diagnosing mental disorders,

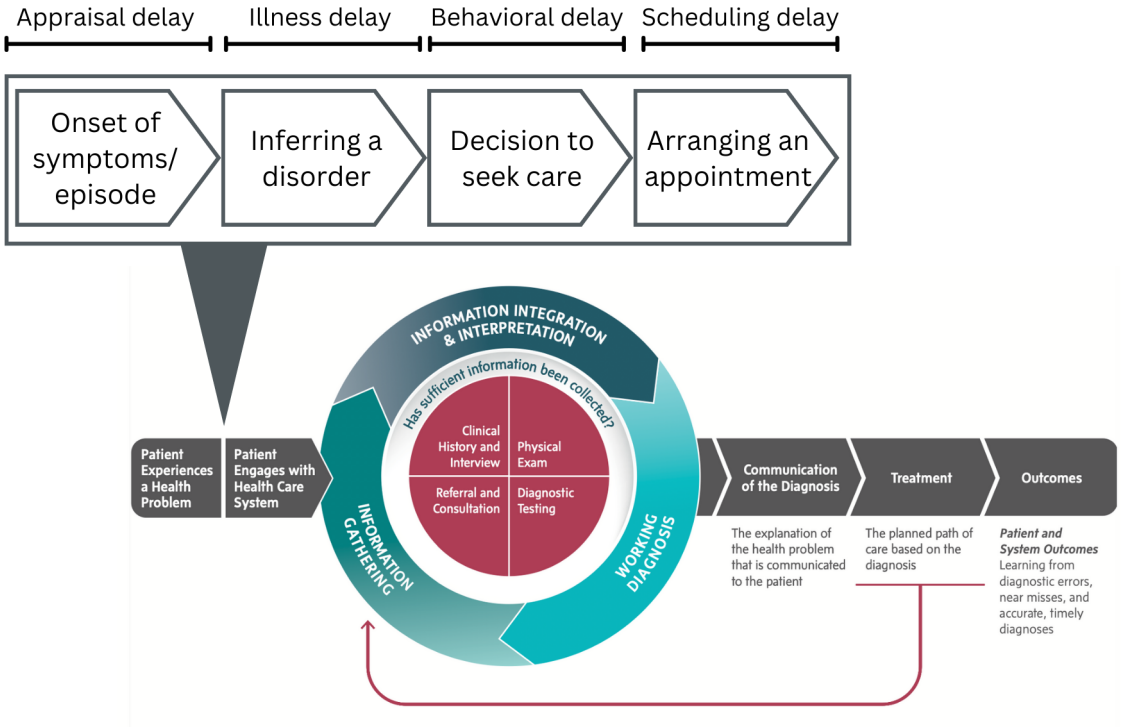

Figure 1 The diagnostic process model from the National Academies of Science, Medicine and Engineering report Improving Diagnosis in Health Care[4] (reprinted with permission) emphasises data gathering and synthesis, as depicted in the circular portion of the diagram. To better describe the context of missed and delayed diagnosis in mental health, we suggest an elaboration of this model (depicted in the upper portion) that describes the steps and potential delays involved in seeking and accessing mental health services (adapted from Andersen *et al*[64]).

elaboration of the NASEM model may be appropriate. The extension of the NASEM model shown in figure 1 is similar to depictions of the diagnostic pathway for other diseases such as cancer.[67 68]

EVIDENCE OF DIAGNOSIS-SPECIFIC PITFALLS AND PROCESS BREAKDOWNS

Studies have brought to light several pitfalls in the diagnosis of common mental disorders, which may inform further studies to identify and mitigate diagnostic errors. While not an exhaustive list, below is a summary of the some of the most frequently studied conditions in this literature. The degrees of both prevalence and interest in these conditions make them strong candidates for further research and development of improvement strategies:

- **Anxiety disorders.** Despite the high prevalence of anxiety disorders (eg, generalised anxiety disorder, panic disorder, phobias), few studies focus on this category of disorders. The available data point to underdetection and misdiagnosis as common problems. In a study of children and adolescents, 18% of anxiety disorder diagnoses were missed by clinicians compared with 1% that were false positives.[23] A clinic-based study of adults found that 29% of major depressive disorder (MDD) diagnoses were not supported by findings on structured interview, and in about half of these cases, an anxiety disorder was a more appropriate diagnosis.[28] In a sample of 61 US veterans with a diagnosis of 'anxiety disorder not otherwise specified,' a more specific diagnosis was justified in 77% of cases, a meaningful finding given that patients with non-specific diagnoses were less likely to receive treatment.[35]
- **Attention deficit hyperactivity disorder (ADHD).** A systematic literature review on diagnostic error in children and adolescents did not identify a clear pattern or underdetection versus overdetection of ADHD.[69] However, US-based research has identified evidence of racial and ethnic disparities in ADHD diagnosis. For instance, even after adjusting for demographic and behavioural risk factors, white children are consistently more likely to be diagnosed with ADHD than their Black, Hispanic/Latino and Asian peers.[70–73] There is some evidence that diagnostic disparities between white and Black children has narrowed over time, but disparities in treatment have not narrowed in turn.[74] Additionally, a study of 685 children found evidence that ADHD was underdetected in children with neurological disorders, suggestive of diagnostic overshadowing.[75]
- **Autism spectrum disorder (ASD).** Older age at diagnosis is considered a marker of delayed identification, which may indicate missed opportunities in diagnosis. Children who are higher functioning and have less severe or atypical symptoms are at risk for later diagnosis.[65 76 77] Later diagnosis of ASD has also been associated with female gender,[78 79] lower family education and socioeconomic status,[76 77 79 80] less reliable access to healthcare,[65 66] history of adverse childhood experiences[81] and prior diagnosis of ADHD.[82] Racial and ethnic disparities in the

diagnosis of ASD have been documented,[83 84] although findings are inconsistent across studies.[85 86]

- **Mood disorders.** Research suggests a variety of potential problems in the diagnosis of MDD. A self-reported clinical diagnosis of 'depression' had a 62% false-positive rate in a study of over 5000 US adults.[24] In a UK study of 441 people with a recent (past 5 years) diagnosis of MDD, 15% did not meet criteria for MDD or any mood disorder and 30% had undetected bipolar disorder (type I or II).[25] Studies performed outside of the USA and UK document care delays in MDD,[87 88] and a study from Israel found that underdetection occurred more frequently than false-positive diagnosis.[89] Missed and delayed diagnoses are consistently documented in bipolar disorder.[90] Patients with bipolar disorder often experience depressive episodes before (hypo)manic mood symptoms emerge, and thus a diagnostic journey from MDD to bipolar disorder can be expected in many cases. However, failure to assess previous episodes of elevated mood in a depressed patient is a source of diagnostic error. For example, in the aforementioned UK study, among patients with bipolar disorder who were first diagnosed with MDD, about half reported elevated mood symptoms even before their first MDD diagnosis.[25] Additional studies suggest possible missed opportunities to assess manic symptoms at the time of a mood disorder diagnosis, with a significant proportion of major depressive disorder diagnoses converted to bipolar disorder on re-evaluation.[29 91–94] Other studies suggest that bipolar disorder is often misdiagnosed initially as a psychotic disorder.[95 96]
- **Schizophrenia** is a challenging diagnosis, especially in the early stage of the disorder. Several studies suggest that an initial diagnosis of schizophrenia changes after further assessment within a short-term interval in 36–51% of patients.[40 97 98] However, it is unclear to what extent these initial incorrect diagnoses reflect 'missed opportunities' versus other diagnostic challenges. Another concerning signal for missed opportunities comes from studies of racial disparities, which show that Black patients are more likely than white patients to be diagnosed with schizophrenia even when adjusting for clinical and demographic risk factors.[99–101]

To better understand these diagnostic pitfalls and translate them into preventive strategies, it will be important to clarify common diagnostic process breakdowns. Research on diagnostic error in other fields of medicine has identified both general and disease-specific pitfalls that can inform improvements to clinical training and practice.[102] Adaptation of existing frameworks to classify diagnostic process breakdown frameworks[51 103] for use in mental health settings may help facilitate future efforts. For instance, Fletcher *et al*'s adaptation of a checklist to assess missed opportunities in diagnosis yielded good reviewer agreement on presence/absence of diagnostic errors in a review of 103 records of US veterans with anxiety disorder diagnoses.[11]

POTENTIAL INTERVENTIONS TO REDUCE DIAGNOSTIC ERROR IN MENTAL HEALTH

Although existing studies of diagnostic error have highlighted potential intervention targets, few studies have tested specific strategies to improve diagnostic decision-making and reduce error in psychiatric diagnosis. We are aware of only two publications that evaluated individual-level interventions to facilitate clinician cognition in 'real time.' In a randomised study of 475 clinicians who assigned diagnoses based on vignettes, use of checklists to facilitate assessment (vs no checklists) resulted in fewer false-positive diagnoses of MDD, generalised anxiety disorder and borderline personality disorder. However, checklist use also led to underdetection of MDD.[57] Another study randomised 137 mental health professionals to receive brief education about paediatric bipolar disorder, versus education about cognitive biases and corrective strategies, prior to evaluating four vignettes. Participants in the 'de-biasing' condition gave more accurate diagnostic impressions and made fewer errors.[54] Although both studies were conducted within low-fidelity simulations, they join a larger body of work suggesting that cognitive interventions may improve clinicians' diagnostic performance.[104]

Distributing the work of diagnosis among team members is another potential avenue for intervention that emerges from the literature. In a randomised trial, 296 new psychiatric outpatients were randomised to receive usual care vs the addition of a structured clinical interview (SCID) conducted by a psychiatric nurse within 2 weeks of the patient's intake visit. Results of the interview were provided to the psychiatrist. Within 90 days, the diagnosis changed in 73% of the interview group vs 16% of patients assigned to usual care.[105] In primary care settings, where a large proportion of mental disorder diagnoses are identified, the integration of behavioural health professionals as team members may facilitate screening and diagnosis of mental disorders.[106 107] Integration of mental health services is supported by position statements from the American College of Physicians[108] and the American Academy of Family Physicians.[109] Further studies should evaluate how error in the diagnosis of mental disorders is conceptualised in primary care versus specialty mental health settings.

Interventions to reduce diagnostic errors in mental health need further development. Batstra *et al* advocated for a conservative 'stepped diagnosis' approach that allows for diagnostic evolution within an episode of care without delaying treatment.[110] Suggested interventions that have appeared in the diagnostic error literature, including second opinions, decision support tools

and patient engagement strategies, are promising avenues for further investigation in mental health settings.[111 112]

DISCUSSION

We aimed to summarise the state of current research on diagnostic error in mental disorders. The volume of literature on this topic indicates that diagnostic error is well understood to be a problem. However, an obstacle to progress is a lack of clear consensus on how to conceptualise, define and measure errors in mental health diagnosis. Formal definitions for diagnostic errors, if they are cited at all, are used inconsistently in the mental health literature and are not always consistent with definitions used elsewhere in the literature on diagnostic quality and safety. Without a useful way to conceptualise diagnostic errors, it will be difficult to gain insight into how best to prevent them.

Another limitation of much of the literature is that it is difficult to distinguish preventable diagnostic error from other possible causes of diagnostic delays or discrepancies. Very few studies use methods to assess whether sufficient information was available to make an earlier, correct diagnosis. Because variation in diagnosis is subject to many influences, some outside of the clinician's control, future research should focus on identifying preventable missed opportunities. Fortunately, recent evidence suggests that strategies to identify missed diagnostic opportunities in record review can be adapted to mental health settings.[11] Framing diagnostic errors as learning opportunities is consistent with a culture of safety and improvement and can help break down barriers to open acknowledgement and discussion of this important issue.[113–115]

Advancing concepts and measurement strategies will yield better estimates of diagnostic errors and help identify ways to prevent them. However, it is not necessary to quantify these with precision before working towards tools and interventions to reduce errors. Development of measurement methods and interventions can and should occur in parallel. Bridging the gap between the mental health field and the emerging field of diagnostic safety promises to enhance both fields and advance the science of improving patient care. Given the increasingly large share of the population who seek care for mental health problems,[116 117] even modest improvements in diagnostic quality have potential to translate to meaningful gains in patients' health and quality of life.

Correction notice This aritcle has been corrected since it was first published online. The funding statement has been updated. In addition, the author Ashley N D Meyer was incorrectly listed as Ashley Mayer. This has now been updated.

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