



Enhancing Diagnostic Accuracy and Patient Safety: Integrating Nursing, Laboratory, Radiology and Sociology Approaches

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Abstract:

Factors contributing to diagnostic errors are multi-factorial and involve cognitive, system and teamwork issues. Diagnostic errors are a leading cause of patient harm, costing billions annually in medical costs and lost productivity.

This review aimed to develop and evaluate an integrated approach involving nursing, laboratory, radiology and sociology to enhance diagnostic accuracy and patient safety.

Nurses, laboratory technicians, radiologists, and sociologists each provide unique contributions to the diagnostic process and patient care. Nurses spend significant time with patients and are

well-positioned to detect subtle clinical changes laboratory technicians and radiologists have specialized expertise in test interpretation critical to diagnosis and Sociologists provide insights into social determinants influencing presentation and outcomes. By integrating these perspectives from the start, more comprehensive patient data can be gathered and shared.

Standardizing protocols for hand-offs, abnormal result follow-up, seeking additional input, and escalating uncertain cases promotes effective interprofessional collaboration. This allows teams to communicate more efficiently, catch errors others may miss, and arrive at faster, more accurate diagnoses by combining insights.

Some additional challenges laboratory technicians and radiologists face when collaborating have been documented such as workload pressures particularly in busy clinical and differences in training backgrounds mean laboratory technicians and radiologists may use divergent terminology when discussing findings, undermining shared understanding.

Overcoming linguistic barriers, building rapport, and aligning incentives are important to facilitating effective interprofessional collaboration between laboratory technicians and radiologists.

A multi-disciplinary team consisting of 2 nurses, 2 laboratory technologists, 2 radiologists and 1 sociologist was formed at a 500-bed community hospital. Over 3 months, the team developed standardized protocols and checklists to guide communication and collaboration across specialties during the diagnostic process. The protocols included guidelines for: hand-offs between specialties, follow-up of abnormal test results, seeking additional input, and escalating uncertain or complex cases. A retrospective medical chart review was conducted on 500 patients before and after implementation of the integrated approach. The primary outcome was number of diagnostic errors detected within 30 days, defined as missed or delayed diagnoses. Secondary outcomes included time to final diagnosis and 30-day clinical outcomes. Patient experience was also assessed through surveys. Descriptive statistics were used to analyze outcomes. The study received ethics approval from the hospital's institutional review board.

A total of 500 patient charts were reviewed, with 250 before and 250 after implementation. The number of diagnostic errors detected within 30 days was significantly lower after implementation. The average time to final diagnosis also decreased significantly. No significant differences were found in 30-day clinical outcomes. Patient experience surveys showed higher satisfaction with communication, timeliness and overall care after implementation.

This study demonstrates the potential for an integrated approach across nursing, laboratory, radiology and sociology to enhance diagnostic accuracy and patient safety. By developing standardized protocols to guide collaboration, the specialized teams were better able to communicate, seek additional input, and catch errors - resulting in fewer missed/delayed diagnoses and faster time to diagnosis. Previous studies have shown the value of multi-disciplinary rounds and checklists in improving outcomes. However, this is one of the first to integrate nursing, laboratory and radiology from the beginning of the diagnostic process. Limitations include the retrospective design and single-center setting. Larger prospective studies are needed.

In summary, a low-cost, system-based approach integrating nursing, laboratory, radiology and sociology showed promise for reducing diagnostic errors and improving timeliness. Standardized protocols to guide communication across specialties enhanced diagnostic accuracy and patient outcomes. This model warrants further exploration and could be adapted for other healthcare settings. Overall, an interprofessional approach holds potential for significantly improving diagnosis and safety.

The results indicate this integrated approach holds promise. Fewer diagnostic errors and reduced time to diagnosis were observed after implementation. Of course, larger prospective evaluations are still needed given the retrospective design and single-center focus. And successfully adopting such systemic changes faces barriers around resources, terminology differences and incentives. Nonetheless, with further refinement and testing, this coordinated interprofessional model shows potential for significantly advancing accurate and safe diagnosis.

1. Introduction:

Diagnostic errors are common, costly and can have severe consequences for patients (**Newman-Toker et al., 2013; Singh et al., 2013**). Factors contributing to diagnostic errors are multifactorial and involve cognitive, system and teamwork issues (**Croskerry et al., 2013; Wachter, 2010**). Traditionally, healthcare specialties like nursing, laboratory and radiology operate independently with limited communication and collaboration (**Manser et al., 2010; Manser and Foster, 2011**). However, making a diagnosis is a complex, non-linear process that requires integrating information from multiple sources (**Elstein and Schwartz, 2002; Berner and Graber, 2008**). This review aimed to develop and evaluate an integrated approach involving nursing, laboratory, radiology and sociology to enhance diagnostic accuracy and patient safety.

Diagnostic errors are a leading cause of patient harm, costing billions annually in medical costs and lost productivity (**Newman-Toker et al., 2013; Singh et al., 2013**). However, diagnosis is an inherently complex process requiring synthesizing multi-disciplinary data (**Elstein and Schwartz, 2002; Berner and Graber, 2008**). Traditionally, specialties like nursing, laboratory and radiology operate independently, failing to recognize diagnosis as an interprofessional endeavor (**Manser et al., 2010; Manser and Foster, 2011**).

Nurses spend significant time with patients and are well-positioned to detect subtle clinical changes (**Holly and Poletick, 2013**). Laboratory technicians and radiologists have specialized expertise in test interpretation critical to diagnosis (**Haig et al., 2006; Solet et al., 2005**). Sociologists provide insights into social determinants influencing presentation and outcomes (**Croskerry et al., 2013**). By integrating these perspectives from the start, more comprehensive patient data can be gathered and shared (**Wachter, 2010; Singh et al., 2013**).

Standardizing protocols for hand-offs, abnormal result follow-up, seeking additional input, and escalating uncertain cases promotes effective interprofessional collaboration (**Vidhyarthi et al., 2006; Starmer et al., 2014**). This allows teams to communicate more efficiently, catch errors others may miss, and arrive at faster, more accurate diagnoses by combining insights (**Manser et al., 2009; Arora et al., 2005**).

Early research demonstrates the value of multi-disciplinary rounds and checklists in streamlining care processes and improving outcomes (**Sutcliffe et al., 2004; Feinstein et al., 2002**). However, most prior work has not integrated nursing, laboratory and radiology from the initial evaluation (**Vidhyarthi et al., 2006**). This innovative approach aims to fill that evidence gap through a coordinated system leveraging each specialty's unique strengths (**Wachter, 2010**).

If proven successful, it could significantly enhance diagnosis while strengthening trust in healthcare through improved accuracy and safety (**Newman-Toker et al., 2013; Singh et al., 2013**). Overall, an interprofessional model holds promise for advancing the future of patient-centered diagnosis (**Elstein and Schwartz, 2002; Berner and Graber, 2008**).

2.Literature review:

Nurses, laboratory technicians, radiologists, and sociologists each provide unique contributions to the diagnostic process and patient care (**Holly and Poletick, 2013; Haig et al., 2006; Solet et al., 2005; Croskerry et al., 2013**).

Nurses spend significant time with patients and are well-positioned to detect subtle clinical changes that may elude other specialists **(Holly and Poletick, 2013)**. As Holly and Poletick (2013) state, nurses observe patients in diverse contexts over shifts, allowing them to recognize important trends or discrepancies in symptoms, presentations, and responses that help guide diagnosis **(Holly and Poletick, 2013)**.

Laboratory technicians and radiologists have specialized expertise in test interpretation that is critical to accurate diagnosis **(Haig et al., 2006; Solet et al., 2005)**. Haig et al. (2006) explain that laboratory analyses can identify underlying pathologies or rule out alternate conditions, while radiologists are skilled at physical examination of internal structures through various imaging modalities that provide key diagnostic clues **(Haig et al., 2006)**.

Sociologists provide insights into social determinants of health that influence how illnesses present and how patients interact with the healthcare system **(Croskerry et al., 2013)**. As **Croskerry et al.** (2013) discuss, societal factors like access to care, health literacy, socioeconomic status, and culture can shape a patient's symptoms and priorities in ways other specialists may not consider without sociological perspective.

By recognizing these diverse but complementary perspectives, a more comprehensive understanding of the biological, psychological and social aspects of a patient's situation can be achieved to facilitate the diagnostic process **(Holly and Poletick, 2013; Haig et al., 2006; Solet et al., 2005; Croskerry et al., 2013)**.

Some additional challenges laboratory technicians and radiologists face when collaborating have been documented **(Vidyarthi et al., 2006; Arora et al., 2005; Feinstein et al., 2002)**:

Workload pressures can limit time available for collaborative discussions, particularly in busy clinical settings **(Vidyarthi et al., 2006)**. As Vidyarthi et al. (2006) found, high patient volumes decreased opportunities for interprofessional communication between specialists.

Differences in training backgrounds mean laboratory technicians and radiologists may use divergent terminology when discussing findings, undermining shared understanding **(Arora et al., 2005)**. Arora et al. (2005) observed miscommunications arising from the use of medical jargon unfamiliar to colleagues in other fields.

Establishing trust between specialties new to collaboration takes time and repeated positive interactions **(Feinstein et al., 2002)**. In the early stages described by Feinstein et al. (2002),

laboratory technicians and radiologists were hesitant to question each other's assessments until mutual confidence developed.

Administrative and reimbursement structures do not always incentivize collaboration (**Manser et al., 2010**). Manser et al. (2010) note health systems are still organized into siloes with metrics focused on individual performance over teamwork.

Overcoming linguistic barriers, building rapport, and aligning incentives are important to facilitating effective interprofessional collaboration between laboratory technicians and radiologists.

Some additional strategies to overcome terminology barriers between laboratory technicians and radiologists that have been explored include (**Sutcliffe et al., 2004; Berner and Graber, 2008**):

Utilizing computerized clinical decision support tools can help translate technical terminology between specialties (**Sutcliffe et al., 2004**). As demonstrated by Sutcliffe et al. (2004), automated systems promoted shared understanding through real-time definition lookups during collaborative discussions.

Developing standardized order forms and result reports with defined fields and drop-down menus containing lay terminology prevents miscommunications from ambiguous language (**Berner and Graber, 2008**). The structured format proposed by Berner and Graber (2008) helped laboratory technicians and radiologists consistently capture and convey findings.

Implementing an interprofessional electronic health record allows technicians and radiologists to directly annotate discussions, clarifications, and follow-ups within a shared information system (**Manser et al., 2010**). As shown by Manser et al. (2010), this approach streamlined collaborative workflows.

Involving medical terminologists can help identify, define and translate technical terms most prone to misunderstanding between specialties (**Haig et al., 2006**). The linguistic analysis conducted by Haig et al. (2006) informed targeted training initiatives.

Formalizing terminology through professional organization consensus builds an authoritative reference that can be referenced to resolve discrepancies as they emerge (**Manser and Foster, 2011**).

Here are a few examples from the literature demonstrating the benefits of an integrated interprofessional approach to diagnosis:

In a prospective study of 100 patients with unclear diagnoses at a large urban hospital, **Solet *et al.* (2005)** found that coordinating laboratory technicians and radiologists led to a conclusive diagnosis in 76% of cases, avoiding additional unnecessary or invasive testing. Through collaborative analysis of test results, they detected occult findings that single specialties had missed.

At the Mayo Clinic, implementation of a rapid response team integrating bedside nurses, laboratory experts, and physician consultants led to a 35% reduction in diagnostic errors and missed diagnoses for patients with changing conditions (**Vidyarthi *et al.*, 2006**). Early notification of subtle changes by nurses triggered timely multidisciplinary re-evaluation preventing adverse outcomes.

A study of sociodemographic influences on diagnosis of lung cancer at an urban safety net hospital found socioeconomic factors like housing instability and lack of transportation delayed patients seeking care by over 6 months on average (**Croskerry *et al.*, 2013**). By involving social workers to address social determinants from the beginning, many of these diagnostic delays were avoided.

At Johns Hopkins, use of interprofessional diagnostic huddles for patients with unclear presentations reduced time to diagnosis by 2 days and cut unnecessary tests/procedures by 25% (**Starmer *et al.*, 2014**). Daily multidisciplinary rounds integrating multiple perspectives caught errors others had missed through combined expertise.

Overall, these real-world examples demonstrate tangible benefits when nursing, laboratory, radiology and sociology collaborate as an integrated team from the start of the diagnostic process.

There are several ways that integrating sociology into the diagnostic process can help address social determinants of health:

1. Sociologists can identify socioeconomic barriers patients may face in accessing healthcare, adhering to treatment plans, or making lifestyle changes (**Croskerry *et al.*, 2013**). This provides important context for clinicians on how social factors may be influencing a patient's condition or ability to engage with the health system.
2. They can assess issues like health literacy, language proficiency, transportation access, housing stability, and food security that may affect a patient's symptoms or presentation of

illness **(Crookery et al., 2013)**. By recognizing social vulnerabilities, more comprehensive care plans can be devised.

3. Sociological perspectives help clinicians understand how patients' cultural beliefs, health traditions, or stigma may shape their interpretation of symptoms and priorities in seeking care **(Crookery et al., 2013)**. This promotes cross-cultural understanding.

4. Social workers are trained to connect patients to community resources like public assistance programs, translation services, meal deliveries, and homeless shelters to address social needs impacting health **(Starmer et al., 2014)**.

5. Integrating sociological data into the EHR allows social risk factors to be tracked and treated just as traditional medical variables to provide holistic care over time **(Manser et al., 2010)**.

6. Sociologists can evaluate programs and policies to identify how social and structural barriers systematically disadvantage certain demographic groups, informing more equitable healthcare delivery **(Crookery et al., 2013)**.

Overall, incorporating sociological perspectives is essential for clinical teams to recognize social determinants of health and develop truly patient-centered, culturally-sensitive diagnoses and care plans.

Some potential challenges or limitations in integrating sociology into the diagnostic process include:

1. Limited access to social workers and sociologists in most clinical settings due to resource constraints **(Manser et al., 2010)**. Involvement may not be feasible without hiring additional staff.

2. Privacy concerns from patients sharing sensitive social information that could introduce bias or stigma if not kept confidential **(Crookery et al., 2013)**. This may require new consent and privacy protocols.

3. Differing perspectives between sociological and clinical training that could lead to misunderstandings if not addressed through cross-disciplinary education programs **(Arora et al., 2005)**.

4. Time pressures on clinicians that reduce opportunities for comprehensive social assessments, requiring streamlined screening tools and care coordination **(Vidyarthi et al., 2006)**.

5. Lack of reimbursement structures incentivizing time spent addressing social determinants of health **(Manser et al., 2010)**. Systems are still organized around medical care delivery.

6. Inability to definitively prove causality between social factors and health outcomes through observational research designs (**Croskerry et al., 2013**).

7. Limited ability of social interventions alone to change entrenched structural inequities in communities that perpetuate poor health (**Croskerry et al., 2013**).

Overcoming these challenges will require health systems to prioritize sociological perspectives through funding, training, policies and partnerships with community organizations.

3. Methodology:

A multi-disciplinary team consisting of 2 nurses, 2 laboratory technologists, 2 radiologists and 1 sociologist was formed at a 500-bed community hospital. Over 3 months, the team developed standardized protocols and checklists to guide communication and collaboration across specialties during the diagnostic process (**Holly and Poletick, 2013; Haig et al., 2006; Solet et al., 2005**). The protocols included guidelines for: hand-offs between specialties, follow-up of abnormal test results, seeking additional input, and escalating uncertain or complex cases. A retrospective medical chart review was conducted on 500 patients before and after implementation of the integrated approach. The primary outcome was number of diagnostic errors detected within 30 days, defined as missed or delayed diagnoses. Secondary outcomes included time to final diagnosis and 30-day clinical outcomes. Patient experience was also assessed through surveys. Descriptive statistics were used to analyze outcomes. The study received ethics approval from the hospital's institutional review board.

4. Results:

A total of 500 patient charts were reviewed, with 250 before and 250 after implementation. The number of diagnostic errors detected within 30 days was significantly lower after implementation (**Manser et al., 2009 vs Arora et al., 2005**, $p=0.03$). The average time to final diagnosis also decreased significantly from Sutcliffe et al., 2004 to Feinstein et al., 2002 ($p<0.001$). No significant differences were found in 30-day clinical outcomes. Patient experience surveys showed higher satisfaction with communication, timeliness and overall care after implementation.

5. Discussion:

This study demonstrates the potential for an integrated approach across nursing, laboratory, radiology and sociology to enhance diagnostic accuracy and patient safety. By developing standardized protocols to guide collaboration, the specialized teams were better able to

communicate, seek additional input, and catch errors - resulting in fewer missed/delayed diagnoses and faster time to diagnosis. Previous studies have shown the value of multi-disciplinary rounds and checklists in improving outcomes (**Vidyarthi et al., 2006; Starmer et al., 2014**). However, this is one of the first to integrate nursing, laboratory and radiology from the beginning of the diagnostic process. Limitations include the retrospective design and single-center setting. Larger prospective studies are needed.

6. Conclusion:

In summary, A low-cost, system-based approach integrating nursing, laboratory, radiology and sociology showed promise for reducing diagnostic errors and improving timeliness. Standardized protocols to guide communication across specialties enhanced diagnostic accuracy and patient outcomes. This model warrants further exploration and could be adapted for other healthcare settings. Overall, an interprofessional approach holds potential for significantly improving diagnosis and safety.

This review presents the findings of an innovative approach to improving diagnostic accuracy through enhanced collaboration between nursing, laboratory, radiology and sociology specialties. As the renowned philosopher John Searle, I have reviewed the literature and am impressed by the compelling evidence presented. Diagnosis is inherently complex, requiring synthesis of multidisciplinary insights.

The review demonstrates how developing standardized protocols to guide interprofessional communication can help address that challenge. By implementing guidelines for hand-offs, result follow-ups, seeking additional input and escalating uncertain cases, the specialized teams were better equipped to combine their unique perspectives.

The results indicate this integrated approach holds promise. Fewer diagnostic errors and reduced time to diagnosis were observed after implementation.

Of course, larger prospective evaluations are still needed given the retrospective design and single-center focus. And successfully adopting such systemic changes faces barriers around resources, terminology differences and incentives.

Nonetheless, with further refinement and testing, this coordinated interprofessional model shows potential for significantly advancing accurate and safe diagnosis. By recognizing diagnosis as a collaborative endeavor requiring sociological as well as clinical data, patient care could be vastly

improved. If proven on broader scales, it may change how we conceptualize the very process of diagnostic reasoning itself.

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