2018

Addressing Disparities in Diagnostic Errors & Medication Safety in the Home

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Executive Summary

Introduction

Diagnostic errors (DE) and medication safety in the home (MSH) are two emerging health care issues receiving increasing attention for their impact on patient safety. A diagnostic error is defined as the failure to establish an accurate and timely explanation of the patient's health problem(s) or communicate that explanation to the patient.[1] Diagnostic errors stem from many causes, including inadequate collaboration and communication among clinicians, patients, and their families.

Whereas hospital-based patient safety efforts have become quite advanced, medication safety in the home is an important area to better understand. Strategies to prevent DE and MSH for an increasingly diverse population are critical to ensuring equitable care and outcomes for all patients. The potential of medication errors among the home health care population is greater than in other health care settings because of the unstructured environment and unique communication challenges in the home health care system.

The Institute of Medicine Report *Unequal Treatment* highlighted that in addition to existence of racial and ethnic disparities in *health,* there is also evidence of racial and ethnic disparities in *health care.* In sum, members of minority populations may receive a lower quality of care when they are in the health care system than their white counterparts, even when controlling for social determinants and insurance status.

This report highlights key issues related to disparities in diagnostic errors and medication safety in the home and the objectives were to:
1) Understand the current state of knowledge in the areas DE and MSH.
2) Solicit input from subject matter experts to determine: (a) if any work has been done at the intersection of disparities and DE and MSH; (b) how communication difficulties (included limited health literacy, limited English proficiency, cultural beliefs, and mistrust, among other areas) might impact DE and MSH; and (c) what are areas of study, exploration, and intervention that address disparities in DE and MSH.
3) Provide overall recommendations on key areas that require further exploration and funding to advance the field of disparities in DE and MSH.

Methods

We conducted a search of the peer-reviewed literature to identify research findings related to DE, MSH, and disparities in health care. To supplement and expand on the information from the literature review, we conducted a telephonic town hall and key informant interviews with experts in the fields of DE and MSH. The town hall and interviews focused on the intersection of these issues in diverse populations. We used a semi-structured interview guide to prompt discussion and explore the key factors that would lead to disparities in DE and MSH; what strategies are needed to advance the intersection of these fields going forward; and opportunities for funding future research and interventions to advance this work.

Key Findings & Recommendations

Diagnostic Error	
Key Findings	1. There is limited research in general in the area of diagnostic errors—including in the area of measurement—and almost nothing on disparities, if anything at all. 2. Having access to clinical expertise—and access to health care more generally—is critical to prevent diagnostic errors, and this is more challenging for vulnerable populations and can contribute to disparities. 3. Symptom expression may vary across presentations, making communication key. Furthermore, assumptions, jumping to conclusions, and being biased by something they saw or heard from the patient early in the diagnostic process is a major contributor to diagnostic errors, which may be worse across cultures, and due to stereotyping and implicit bias. 4. Patient engagement is key to preventing diagnostic errors, and the comfort level with this varies across cultures. 5. The future of decision support, including machine learning and artificial intelligence, is susceptible to disparities and may contribute to diagnostic error.
Recommendations	1. Improve data collection and monitoring for disparities in diagnostic errors. 2. Facilitate access to health care and specialty care for diverse populations. 3. Embed cultural competency and stereotyping/implicit bias principles or training into any effort that aims to address diagnostic errors. 4. Promote and facilitate patient engagement among diverse populations. 5. Assure the incorporation of cultural competence and stereotyping/implicit bias principles into all efforts that support diagnostic accuracy, including artificial intelligence and machine learning.

Medication Safety in the Home	
Key Findings	1. There is limited research in general in the area of medication safety in the home—including in the area of measurement—and almost nothing on disparities, if anything at all. 2. Social determinants of health have a major impact on medication safety in the home. 3. Limited English proficiency, low health literacy, illiteracy, and cultural beliefs can impact medication safety in the home. 4. Patient engagement is key to medication safety in the home, and the capacities vary across cultures.
Recommendations	1. Improve data collection and monitoring for disparities in medication safety in the home. 2. Create innovative risk profiling tools. 3. Address the social determinants through multidisciplinary home visits and pharmacist engagement. 4. Improve medication labeling and counseling to address low health literacy and limited English proficiency. 5. Promote and facilitate patient engagement among diverse populations.

I.   Introduction

Diagnostic errors and medication safety in the home are two important and emerging health care issues that are receiving increasing attention and have become the new frontier of patient safety. A diagnostic error is defined as the failure to establish an accurate and timely explanation of the patient's health problem(s) or communicate that explanation to the patient.[1] Diagnostic errors stem from many causes, including inadequate collaboration and communication among clinicians, patients, and their families. Diagnostic errors may cause harm to patients by preventing or delaying appropriate treatment, providing unnecessary or harmful treatment, or resulting in psychological or financial repercussions. It is estimated that 5 percent of U.S. adults who seek outpatient care each year experience a diagnostic error. Postmortem examination research spanning decades has shown that diagnostic errors contribute to approximately 10 percent of patient deaths, and medical record reviews suggest that they account for 6 to 17 percent of adverse events in hospitals.

Whereas hospital-based patient safety efforts have become quite advanced, medication safety in the home is an important area to better understand. Communication and medication reconciliation at discharge are two key areas with the potential to impact medication safety in the home. While this issue is important for all populations, elderly populations are particularly at risk. For example, research has found that elderly home health care patients often take multiple medications for a variety of comorbidities that have been prescribed by more than one provider. The majority of older home health care patients routinely take more than five prescription drugs, and many patients deviate from their prescribed medication regime.[2] Research has found that nearly one-third of older home health care patients have a potential medication problem or are taking a drug considered inappropriate for older people.[3] In summary, the potential of medication errors among the home health care population is greater than in other health care settings because of the unstructured environment and unique communication challenges in the home health care system.[2]

II.   Diagnostic Errors and Medication Safety at Home: Implications for Diverse Populations

The Institute of Medicine Report *Unequal Treatment* highlighted that in addition to existence of racial and ethnic disparities in *health,* there is also evidence of racial and ethnic disparities in *health care.* In sum, members of minority populations may receive a lower quality of care when they are in the health care system than their white counterparts, even when controlling for social determinants and insurance status.[4] There are a variety of factors that put minority patients at greater risk for medical errors. For example, *Unequal Treatment* identified a set of root causes that included, among others:

- Health System-Level Factors: These include issues related to the complexity of the health care system and how it may be disproportionately difficult to navigate for minority patients, as well as the presence or absence of interpreter services to assist patients with limited English proficiency (LEP).

- Care-Process Variables: These include issues related to the health care provider, including clinical uncertainty due to poor communication.

- Patient-Level Variables: These include mistrust and its impact on a patient's refusal of services, poor adherence to treatment, and delays in seeking care and reporting problems.

A closer look at these findings clearly demonstrates the increased risk for diagnostic errors and medication safety errors in the home. First, sociocultural differences between patient and provider influence communication and clinical decision-making, and are especially pertinent given the evidence that links provider-patient communication to patient satisfaction, adherence, and subsequently, health outcomes. [5,6] Thus, when sociocultural differences between patient and provider are not appreciated, explored, understood, or communicated effectively in the medical encounter, patient dissatisfaction, poor adherence, poorer health outcomes, and racial/ethnic disparities in care may result.[7] A national survey by the Commonwealth Fund showed that Hispanics were twice as likely as non-Hispanic Whites to report one or more communication problems such as not understanding their doctor, feeling their doctor did not listen to them, or feeling afraid to ask questions (a third of Hispanics and a quarter of African-Americans and Asian-Americans experience these communication problems).[8] There is no doubt that lack of diversity in the healthcare workforce, and a limited number of bilingual healthcare professionals, further compound this situation[9] as patients may not be able to communicate effectively with those caring for them.

Second, provider-patient communication without an interpreter, in the setting of even a minimal language barrier, is recognized as a major challenge to effective health care delivery. [10-12] Research in this area has shown that Spanish-speaking patients discharged from the emergency room are less likely than their English-speaking counterparts to understand their diagnosis, prescribed medications, special instructions, and plans for follow-up care;[13] less likely to be satisfied with their care or willing to return if they had a problem; more likely to report problems with their care; and less satisfied with the patient-provider relationship. [14]

Third and finally, patients who mistrust their healthcare providers are less satisfied with the care they receive[15] and mistrust of the health care system greatly affects patient's use of services. A national telephone survey conducted by the Kaiser Family Foundation found that there is significant mistrust for the health care system among minority populations. Of the 3,884 individuals surveyed, 36% of Hispanics and 35% of African-Americans (compared to 15% of whites) felt they were treated unfairly in the health care system in the past based on their race and ethnicity. Perhaps even more alarming—65% of African-Americans and 58% of Hispanics (compared to 22% of whites) were afraid of being treated unfairly in the future based on their race/ethnicity. [16]

As we look at the intersection between disparities and patient safety, research shows, for instance, that there are significant disparities in patient safety between English-speaking and limited English proficient hospital patients. [17] LEP patients were more likely to experience medical errors due to communication problems than English-speaking patients, and more likely to suffer from physical harm when errors occur.

To compound matters these matters, our nation is becoming increasingly diverse. The most recent US Census report of 2014 data indicated that the child population is projected to be a majority-minority in 2020, and that by 2044, the US would be a majority-minority population.[18] In addition, nearly 42 million people – 15% of the U.S. population – speak a language other than English at home, and approximately 24 million of that number – 8.6% of the U.S. population – are defined as Limited English Proficient, meaning that they speak English less than "very well".[19] Thus, at least 8.6% of the U.S. population is at risk for adverse events because of barriers associated with their language ability. In summary, as our nation looks forward, it will be critical to develop strategies address disparities and prevent diagnostic errors and medication errors in the home in an increasingly diverse population.

III.   Goals & Objectives

This goal of this report is to identify opportunities to address disparities in diagnostic errors and medication safety in the home, as well as recommendations to meet the needs of diverse populations. The objectives were to:

1) Understand the current state of knowledge in the areas of diagnostic errors (DE) and medication safety in the home (MSH).
2) Solicit input from subject matter experts to determine: (a) if any work has been done at the intersection of disparities and DE and MSH; (b) how communication difficulties (included limited health literacy, limited English proficiency, cultural beliefs, and mistrust, among other areas) might impact DE and MSH; and (c) what are areas of study, exploration, and intervention that address disparities in DE and MSH.
3) Provide overall recommendations on key areas that require further exploration and funding to advance the field of disparities in DE and MSH.

IV.   Methods

We conducted a search of the peer-reviewed literature to identify research findings related to DE, MSH, and disparities in health care. To supplement and expand on the information from the literature review, we conducted a telephonic town hall and key informant interviews with experts in the fields of DE and MSH. The town hall and interviews focused on the intersection of these issues in diverse populations. We used a semi-structured interview guide to prompt discussion and explore the key factors that would lead to disparities in DE and MSH; what strategies are needed to advance the intersection of these fields going forward; and opportunities for funding future research and interventions to advance this work. The 60-minute telephonic town hall took place on December 15, 2017 with the participation of 6 out of 12 invited experts. Key informant interviews were 45 minutes and took place December 2017-January 2018, with participation of 4 experts in DE and 4 in MSH.

Appendix A includes the list of key informants and town hall participants who provided their expertise in the areas of DE and MSH. Appendix B includes the discussion guide used for the town hall meeting and interviews.

V.   Key Findings & Recommendations

Disparities in Diagnostic Error

Literature Review

Based on a review of the literature, there are very few publications that focus on the intersection of disparities and DE. Limited evidence suggests that, for some conditions, racial and ethnic minorities are at higher risk for DE. For example:

- African Americans may be under diagnosed for major depressive disorder and over diagnosed for schizophrenia.[20]
- A 2014 study found that Hispanic and non-White patients were more likely have a missed stroke diagnosis.[21]
- Studies in 2015 and 2013 found that minority women may be more likely to experience delayed diagnosis of breast and cervical cancer and barriers to follow-up care.[22,23] Follow up rates for abnormal screens are also much lower at facilities serving racial and ethnic minorities. [24]
- A 2007 study found that African American children ultimately diagnosed with autism were 3 times as likely to receive another diagnosis first. [21]

There is a lack of robust research on racial and ethnic minorities and patients with limited English proficiency relating to DE. Furthermore, in general, few reliable measures exist to track diagnostic errors (often identified in retrospect via autopsy). The field is moving toward creating measures for DE, but this is in the early stages, with a general lack of consensus on the best method of collecting this data, and no real focus on issues related to disparities.

General recommendations from the literature to reduce DE include:
- Facilitating teamwork in the diagnostic process,
- Developing measures that monitor diagnostic accuracy and ensure that health IT supports patients and healthcare professionals,
- Developing a reporting environment and establishing a work culture that supports the diagnostic error process,
- Providing regular feedback to clinicians on diagnostic performance and formal curricula to educate trainees on medical misdiagnoses, and
- Using "trigger tools" to identify potential adverse events and searching electronic health records to flag specific occurrences.

While these would all advance the field, specific measurement provisions (including those that identify and monitor for DE in different racial and ethnic groups) and customized interventions would be needed to address disparities in DE.

I would argue that the vast majority of diagnostic error that impacts society and patients, there is much more accumulated downside in vulnerable populations than populations that are better off. One of the members of the committee experienced a diagnostic error herself. She also told a story about trying to help her housekeeper access care. She could see that as vulnerable as she was to a diagnostic error in not understanding the healthcare system, she did not have language barriers or any of the things that her housekeeper experienced that put her at an even greater risk. If I think about things from my lens and what resources are available to me, there are people who are entering the diagnostic error journey with even less resources. As we try to get knowledge about what goes wrong, one thing that proves particularly challenging is getting that patient voice from vulnerable populations.

Theme 1: There is limited research in general in the area of diagnostic errors—including in the area of measurement—and almost nothing on disparities, if anything at all.

There is very limited research on the topic of diagnostic errors. The field is early in its development but garnering more attention, particularly with the rapid advancement of technology and decision support tools, artificial intelligence, and machine learning. There hasn't been any substantive research on the intersection of diagnostic errors and disparities in care—or measurement—despite the obvious implications of limited health literacy, limited English proficiency, and the impact of cultural factors on symptom presentation and clinical decision-making, for example.

"There was not much out there. There was not much that talks specifically about vulnerable populations. There exists the assumption that if you improve diagnostic safety as a whole, this will improve care for everyone. This ignores the fact that disparities will still exist despite improvements in this way."

"There have been discussions around what measures and measures of outcomes need to be built into the EHR. I am not very sure about each of the measures or how they could be specifically applied to diagnostic error."

"The question about disparities comes up as lot, but I am not sure that a lot has been done in terms of research. I think everyone is suffering from diagnostic errors and problems in the diagnostic process, but I think that in underserved populations, it has more negative effects and necessitates more urgency."

"I was involved in doing a systematic review looking at interventions to mitigate diagnostic error. We were going through this as part of a bigger project on patient safety strategies, and we were wondering if there was information on cost, implementation, and effectiveness.

There was nothing about disparities in the literature. There might have been a couple of studies out of the 50-80 that did some kind of subgroup analysis. One screening study contained an educational component for harder to reach patient groups."

"In understanding the magnitude of the problem, lack of measurement is one of the biggest barriers. Lack of measurement also becomes a barrier to addressing disparities in diagnostic error as well."

Theme 2: Having access to clinical expertise—and access to health care more generally—is critical to prevent diagnostic errors, and this is more challenging for vulnerable populations and can contribute to disparities. Access to health care, and access to specialty care with specific expertise, was identified as critical to preventing diagnostic errors. Given minorities are more likely to be uninsured or underinsured than their white counterparts, and even when they are insured the may have limited access to specialty care, they may in turn be at much higher risk for diagnostic errors.

"If I may add one other piece that comes up for our membership, access is a huge issue. Many people who come to our hospitals are seeing the healthcare system for the very first time. Not having prerequisite information or not being seen by a doctor on a regular basis adds additional factors in terms of diagnostic errors."

"For people who do not have much money, the services are just not there for them to get high quality care. There are longer waiting lists and fewer appointment slots. This could cause another type of delay. Not every delayed diagnosis is going to harm someone, but some acute types of things or cancer could be quite significant. In general, the issue of access and how it relates to delays in diagnosis is backed up by some data and is a large issue."

"Continuity is so important for diagnosis in order to sort out the signal from the noise. Continuity and access go together."

"Continuity of care, quickly being seen, access, getting good follow-up are essential ingredients in good diagnosis."

"I think discontinuity in insurance coverage is huge. Having some access but not other access is also another factor. This looks like being able to see a primary care doctor but not a specialist. Anything that interrupts the diagnostic journey is an extra threat along the way."

Theme 3: Symptom expression may vary across presentations, making communication key. Furthermore, assumptions, jumping to conclusions, and being biased by something they saw or heard from the patient early in the diagnostic process is a major contributor to diagnostic errors, which may be worse across cultures, and due to stereotyping and implicit bias.

Effective communication between health care providers and patients is essential to achieving an accurate diagnosis. Factors that impede this process, including caring for those with limited health literacy, limited English proficiency, as well as those whose cultural background influences symptom presentation, can increase the risk of diagnostic errors. This is compounded by evidence that supports the impact of stereotyping and implicit bias on clinical decision-making and its contribution to disparities in care, and undoubtedly, diagnostic errors.

"This could even come in the form of a doctor playing down someone's symptoms or that they should not have bothered them about their problem. In venturing into the territory of mental health and substance use and abuse, a poor person who comes in who is on methadone and has pain will be dismissed as drug-seeking."

"If you cannot communicate with your patient, this is a setup for a diagnostic error. 80 percent of the time, the diagnosis comes from the history."

"Symptomatology, from psychiatric issues to heart disease, can vary based on the ethnic or racial group."

"There are access issues at play in terms of knowing about warning signs, knowing what to look for in diagnoses, and how to maneuver the system to achieve a correct diagnosis. Health literacy as it relates to this is critical to diagnosis and how diagnostic error occurs."

"I do hear more about language proficiency and its combination with ethnic minority status as combining factors to create barriers to proper diagnostic quality. We need to see this as a cause and factor issue."

"There are also cultural issues. In terms of cancer, there are some groups that do not get screened because they are afraid of cancer. In our hospital, looking at colon cancer, we were seeing stage 3 and 4, while the published literature was seeing stage 1 and 2. We put in a lot of screening programs to overcome this diagnostic delay."

"Diverse populations may present with symptoms differently and may have certain fears that we are not necessarily attuned to. This not only involves a sensitivity to different symptomatology and fears that a patient may have, but also really focusing on engaging the patient in the diagnostic process."

Theme 4: Patient engagement is key to preventing diagnostic errors, and the comfort level with this varies across cultures.

An engaged, activated patient who is informed and participates in shared decision-making is best protected from diagnostic errors. Consequently, patients with limited experience navigating the health care system, who face communication barriers, and who come from cultures where engagement is not the norm, may be at higher risk for diagnostic errors.

"There are some minorities and cultures where it's inappropriate to question the doctor and to assume that kind of proactive stance that we're looking for."

"One of the things that is lost in this conversation is the involvement of family members, family advocates, and patient advocates. How do we integrate this into the patient safety context? This is an area of interest, because this engagement may mean that advocates or family members of the patient may have the same vulnerabilities as the patient."

"Another facet is patients feeling empowered to ask about or question diagnoses. We think this is really important for patients and we even talk about patients coproducing the diagnosis."

"One question we need to be asking is how do we empower patients to be more engaged and willing to ask questions. People should be able to speak up and even ask for second opinions."

"They need to be attuned to the engagement of diverse populations with the healthcare system, as many minority populations do not feel engaged, especially in the diagnostic process."

"If you can engage the patient, you may not have to deal with diagnostic errors coming from the patient's sense of "why did I have that test?" There is agreement upfront about a course of potential diagnosis and therapy. This may help mitigate the downstream impact of a diagnostic error."

"One area with a specific focus on equity and disparities is that we think that improving and increasing patient engagement in the diagnostic process is extremely important in helping people with lower health literacy, limited English, or [those who] are from another culture. How do these patients engage in the diagnostic process? We need more research here. There is an issue that vulnerable populations may not have the same ability to participate in the diagnostic process."

Theme 5: The future of decision support, including machine learning and artificial intelligence, is susceptible to disparities and may contribute to diagnostic error.

Technology to support evidence-based clinical decision-making—and thus minimize diagnostic errors—is rapidly evolving. This includes the evolution of machine learning and artificial intelligence. The inputs and individuals that build this technology can be susceptible to the same factors that currently lead to disparities in care—and subsequently disparities in diagnostic errors. This includes the inability to identify cultural variations in symptom presentation, or the build-in of stereotypic or biased patterns that do not take into account the factors that are critical to diagnostic accuracy in diverse populations.

"The machine-learning is dependent on who is inputting the information and how sensitive their radar is, how culturally competent they are, whether they have the tools to bridge language barriers."

"Machine learning is predicated on the inputs that providers (or patients) put in. They have the potential to be just as biased as the providers that are inputting the information into these decision support structures."

Recommendations

Recommendation 1: Improve data collection and monitoring for disparities in diagnostic errors.

As initiatives develop to better identify and monitor diagnostic errors, every effort should be made to assure that the impact on diverse populations is considered, as well as how these data collection and measurement efforts can be sure to capture disparities. This would require socializing the diagnostic errors research and intervention community on how disparities in diagnostic errors can emerge, and how they should consider this in their design and development of tools and strategies for the field. This can be accomplished through a *convening of leaders of the field*, and/or the development of a *guide* that could be disseminated to leaders in the field that orients and informs them on the importance of these issues.

Recommendation 2: Facilitate access to health care and specialty care for diverse populations.

Ongoing efforts to improve access to health care in general should help address diagnostic errors, yet this remains a challenging and evolving issue nationwide. At a minimum, a focus now can be assuring that those who are insured have access to specialty care. Promising practices that leverage technology, such as virtual or e-visits that address the limited availability of specialists in certain communities, or mitigate barriers related to social determinants of health (SDH) such as transportation, should be developed to address diagnostic errors. Spurring innovation in this area could be accomplished by *convening technology leaders* to tackle these issues, or supporting a *hackathon or crowdsourcing of ideas to stimulate progress and disruption*.

Recommendation 3: Embed cultural competency and stereotyping/implicit bias principles or training into any effort that aims to address diagnostic errors.

As systems are built and efforts emerge and develop to train providers on how to avoid diagnostic errors, cultural competency and stereotyping/implicit bias principles and training should be incorporated into these initiatives. In particular, such principles and training should focus on how patients from diverse cultural

backgrounds may present their symptoms in ways that may be varied, and how stereotyping/implicit bias can impact decision-making. This can be accomplished by developing a *task force* or *convening of experts in cultural competence and stereotyping/implicit bias* to inform the field on how these principles can be incorporated into efforts and research focused on diagnostic errors.

Recommendation 4: Promote and facilitate patient engagement among diverse populations.
Patient engagement, as well as patient activation and shared decision-making, are all essential to decreasing diagnostic errors. Efforts to promote advances in this area should include the input and voices of diverse populations. Building on previous efforts to activate and foster engagement among diverse populations, specific work on diagnostic errors should include guidance from leaders in the field, as well as from diverse communities—both leaders from community-based organizations as well as community members themselves. This information can be leveraged to promote patient engagement for different sociocultural groups and can be cultivated through a *convening of multidisciplinary experts and diverse patients*. This might yield information for a *blueprint for action or a guide* that can be used to help activate patients.

Recommendation 5: Assure the incorporation of cultural competence and stereotyping/implicit bias principles into all efforts that support diagnostic accuracy, including artificial intelligence and machine learning.
As teams of technology experts develop tools that support diagnostic accuracy—including artificial intelligence and machine learning—it is critical that these systems be accurate in the care of diverse (not just majority) populations. Anything short of this will further contribute to disparities and diagnostic errors. To achieve this, a *guide* can be developed that would provide tech leaders with principles to assure they are incorporating cultural competence and stereotyping/implicit bias concepts into their ongoing work. This might include the development of an *interactive training* as well.

Disparities in Medication Safety in the Home

Literature Review
A review of the literature on disparities in medication safety in the home revealed several key findings:

- Research demonstrates that "polypharmacy" or the use of 5 or more medications at a time may be linked to a higher proportion of medical errors and is correlated with poor health outcomes.[25]
- Evidence suggests that frequent medication reviews and collaboration with other members of the health care team (pharmacists, home health care nurse, doctors, etc.) will help to prevent adverse events associated with poor medication management.[26]
- Patient education may empower patients to ask more clarification questions about their medications.[27]
- Patients many have cognitive, financial, or other barriers that may increase the difficulty of medication management (e.g. social isolation, lack of support, functional limitations). [2,28]
- Some studies found that limited English proficiency affected prescription understanding for patients. LEP patients were more likely to misunderstand their medication instructions or report confusion on how to take medication properly. [29-31]

There is little consensus on the level of medication errors in home healthcare, and most estimates are derived from studies. Additionally, there is limited data on the level of medical discrepancies and standard measures for this. We found no studies that focused on language and medication error directly.

Recommendations from the literature include:
- Implementing interventions to assure diagnoses are documented for all prescribed medications,
- Increasing pharmacists' role in medication reconciliation during transitions of care,
- Implementing an interdisciplinary approach to medication reconciliation—which includes hospital, nursing home, and pharmacy—that occurs before or during the care transition,
- Establishing a standardized process for reconciling medications from different facilities and creating a plan to address medication discrepancies,
- Emphasizing the importance of interprofessional care (e.g., working with doctors, nurses, and pharmacists) to ensure the safety of the patient, and
- Educating and engaging patients on the importance of medication reconciliation.

Key Informant Interviews and Telephonic Town Hall
The issue of medication safety and its intersection with disparities has not been well described in the landmark studies on outpatient medication safety.

Theme 1: There is limited research in general in the area of medication safety in the home—including in the area of measurement—and almost nothing on disparities, if anything at all.
There is very limited research on the topic of medication safety in the home. The field is early in its development but garnering more attention, particularly with a greater focus on medication reconciliation and preventing readmissions. There hasn't been any substantive research on the intersection of medication safety in the home and disparities in care—or measurement—despite the obvious implications of limited health literacy and limited English proficiency, for example, on being able to understand and adhere to medication regimens.

"They are not tracking data on vulnerable populations at all."

"When we look at the key issues related to disparities the biggest thing is that we are not sharing information about errors and the common types of errors."

Theme 2: Social determinants of health have a major impact on medication safety in the home.
The social determinants of health (SDH)—which include an individual's environment, housing, access to healthy foods and recreation, and the presence of social support, among other factors—have garnered significant attention as part of healthcare transformation, particularly with the great focus on population health and the push to value-based care. SDHs impact medication safety in the home in a myriad of ways, most especially in instances of financial insecurity, housing insecurity, food insecurity, and social isolation.

"One of the newer things that we just started identifying was people with food insecurity. This is leading to episodes of hypoglycemia in diabetic patients who are taking insulin. We are seeing more reports on this. People are starting to look further as to why error happens."

"Certain populations may have caregiver support in the home that ensure that their medications are being taken properly, whereas vulnerable populations may not necessarily have this. They may not have other family members there."

"People are choosing to handle their own medications their own way based on their financial circumstances."

"Putting the meds in the hands of the patients before they leave seems to fill a gap, as the number of failure points once a patient leaves the hospital is huge. For patients who might have cultural, financial, or socioeconomic issues, this is an even bigger problem."

Theme 3: Limited English Proficiency, low health literacy, illiteracy, and cultural beliefs can impact medication safety in the home.

Being able to read and understand medication instructions is essential to medication safety in the home. Factors that impede this process, including limited English proficiency, low health literacy, and cultural influences on adherence behavior, among others, increase the risk of medication errors in the home.

"We see the same issues in patients with limited English. It is also really difficult to find good translations of medications and medication instructions. A lot of our errors come from the fact that pharmacies struggle to provide proficient labels in languages other than English."

"We have also seen a lot of differences in beliefs about illness and how people manage pain as these things relate to culture. There are many issues at play here, such as the interaction of the patient with the provider, stopping medication as soon as symptoms stop, dietary issues with medication adherence, and differences in metabolism."

"I think it goes without saying that diverse and vulnerable populations are at higher risk- especially those with low health literacy, limited English proficiency, or [those who] earn a lower income."

Theme 4: Patient engagement is key to medication safety in the home, and the capacities vary across cultures.
An engaged, activated patient who is informed about their medication instructions is best protected from medication errors in the home. Consequently, patients with limited experience with medication instructions, or those unable to read or understand them, are less able to be engaged and thus may be at higher risk for medication errors in the home.

> *"We talk a lot about patient engagement in medication safety, and I think when you get into low health literacy, it is very difficult to have this done effectively. Things such as agreement on what medication is for and an adherence to a plan come up."*
>
> *"There are also just different models of patient engagement. What matters to the patient may be really different than what matters to the caregiver. With different cultural beliefs about taking medication, the trust component is really critical."*

Recommendations

Recommendation 1: Improve data collection and monitoring for disparities in medication safety in the home.
As initiatives develop to better identify and monitor medication safety in the home, every effort should be made to assure that the impact on diverse populations is considered, as well as how these data collection and measurement efforts can be sure to capture disparities. This would require socializing the medication safety research and intervention community on how disparities can emerge, and how they should consider this in their design and development of tools and strategies for the field. This can be accomplished through a *convening of leaders of the field*, and/or the development of a *guide* that could be disseminated to leaders in the field that orients and informs them on the importance of these issues. An additional strategy may be *pilot testing* of patient and caregiver reporting of outpatient adverse drug events via the patient portal.

Recommendation 2: Create innovative risk profiling tools.
Identifying patient risks for medication errors in the home could be the foundation for tailored interventions and counseling, particularly among diverse populations. Developing software to identify patient risks (Proactive Risk Assessment Software, Vulnerability Index) which then generates a personalized plan based on their practices and medications would a promising strategy. This can be achieved by *convening innovative tech teams* to develop new, innovative, and disruptive risk profiling tools that can be used in hospital and retail settings.

Recommendation 3: Address the social determinants through multidisciplinary home visits and pharmacist engagement.
Given the impact of the social determinants of health on medication safety in the home, and the fact that the SDH are attracting more attention, efforts in medication safety in the home should be focused on addressing this critical area. Engagement of health care teams, including pharmacists, will be critical to better assessing the home environment and deploying strategies to improve medication safety—including training of informal caregivers and patients themselves. This can be achieved by *piloting a community liaison program* in which organizations would send multidisciplinary teams—including a pharmacist—from a hospital into the community,

home, and community pharmacies. The goal would be to assess safety risks and conduct trainings for informal caregivers and patients about how to take medication safely.

Recommendation 4: Improve medication labeling and counseling to address low health literacy and limited English proficiency.

Given the importance of readable, understandable medication labels as a precursor to safety in the home, efforts are necessary to assure that labels are designed to meet the needs of diverse populations. Creating better prescription labels requires the use of icons, pictograms, large font size, clear/plain language, and availability in multiple languages. Evidence-based strategies, such as the Universal Medication Schedule (UMS) and the clear language translations of the UMS, supported by counseling in community pharmacies, can help address disparities in medication safety in the home.[32-34] This can be achieved by *convening innovative graphic and creative design and tech teams* to develop new, innovative, and disruptive labeling strategies. *Developing partnerships* with major retail pharmacies to improve counseling strategies for diverse populations is another promising approach.

Recommendation 5: Promote and facilitate patient engagement among diverse populations.

Patient engagement is critical to medication safety in the home. Efforts to promote advances in this area should include the input and voices of diverse populations. This information can be leveraged to promote patient engagement for different sociocultural groups and can be cultivated through a *convening of multidisciplinary experts and diverse patients*. This might yield information for a *blueprint for action or a guide* that can be used to help activate patients.

VI.   Conclusion

Diagnostic errors (DE) and medication safety in the home (MSH) are receiving increasing attention and have become the new frontier of patient safety, technology, and quality of care. Both areas are in their nascent stages of development; the fields are being better defined by health care leaders, research has begun to provide context to these challenges, and pilot programs are underway to address them and mitigate their negative effects on quality, safety, cost, value, and health outcomes. As with most innovation and technology, there is often a multiyear diffusion lag that occurs as they trickle down to vulnerable, often minority communities. The goal of this effort was to rapidly explore the intersection between DE, MSH, and its impact on minority communities (and subsequent creation and widening of disparities) to significantly shorten the diffusion lag and assure that as these fields grow, no voices are left behind, and the principles of equity are incorporated as part of the expansion from the start. Philanthropic support to advance these efforts will be essential, and there are several key lessons here.

First, not surprisingly, research is limited on the intersection between DE, MSH, and disparities. This is an issue because in the absence of evidence and scientific rigor, creating change is challenging. Nevertheless, health care leaders and key experts in the field interviewed here undoubtedly and unequivocally see how these fields intersect, as well as the need to consider equity and address disparities as work in DE and MSH evolves. Research, infrastructure, pilots, and large interventions to address easy opportunities were all called out and identified as immediate needs. Ultimately, the strong sense was that as the foundation for these fields is being

built now, strong and deliberate consideration must be given to their application to diverse populations, and the importance of equity.

Second, and simultaneously (not sequentially), efforts must be made to build race, ethnicity, language, social determinants of health, and other demographic data into measurement and monitoring systems for both DE and MSH. In the absence of being able to measure the impact of these issues on diverse populations, and identify root causes, real integration of equity will be difficult to achieve. DE and MSH have a long way to go to build measurement systems in general, but including conversations about equity early on will be essential to avoid poorly designed retrofitting in the future. In addition, a strong measurement and monitoring infrastructure will be critical to developing methods for accountability—payment or penalties included.

Third, creative, quick fixes should be developed and deployed to address the obvious voids in the fields of DE and MSH as it relates to disparities and diverse populations. These include improving medication labeling in the case of MSH, and expanding cross-cultural training for providers and access to specialty care for DE, to name a few. Of equal importance is the need to have equity centered in discussions about new technologies, such as machine learning and artificial intelligence, among others. Absent these considerations, disparities are likely to be perpetuated and exacerbated going forward.

Finally, innovative, disruptive thinking and approaches should be deployed to address and prevent disparities due to DE and MSH. This is especially important given the rapid growth of technology in DE and the push towards value (through readmission penalties, for example) for MSH. A funding strategy that is deliberate and builds the infrastructure and substrate for progress in this area is desperately needed and includes: convening experts and thought leaders to explore the intersection between DE and MSH and disparities; building guides for hospitals and health care systems so they can begin to address the voids in current efforts and incorporate these discussions into the design and development of new efforts; and supporting innovative pilots to advance all aspects of this work. Perhaps most importantly, it is critical to socialize to leaders the importance of not leaving equity behind as we innovate in health care. The opportunities are endless, and the resources are now needed to assure progress.

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Appendix A: Key Informant Interviewees & Town Hall Participants

	Diagnostic Error Key Informants		
	Name	**Title & Organization**	**Location**
1	Gordy Schiff, MD	Associate Director of Brigham and Women's Center for Patient Safety Research and Practice	Boston, MA
2	Mark L. Graber, MD	Senior Fellow, RTI International	Cary, NC Waltham, MA
3	Kathryn McDonald, MM, PhD	Executive Director and Senior Scholar, Center for Health Policy and Center for Primary Care and Outcomes Research, Stanford University	Palo Alto, CA
4	Kalpana Ramiah, DrPH, MSc	Director of Research, America's Essential Hospitals	Washington, DC

	Medication Safety Key Informants		
	Name	**Title & Organization**	**Location**
1	Tejal K. Gandhi, MD, MPH, CPPS	Chief Clinical & Safety Officer, President of the Lucian Leape Institute, Institute for Healthcare Improvement (IHI), Associate Professor of Medicine, Harvard Medical School	Boston, MA
2	Urmimala Sarkar, MD, MPH	Associate Professor of Medicine, University of California, San Francisco	San Francisco, CA
3	Judy Smetzer, BSN, FISMP	Vice President, Institute for Safe Medication Practices (ISMP)	Horsham, PA
4	Jay D. Bhatt DO, MPH, MPA, FACP	Senior Vice President and Chief Medical Officer President, Health Research & Educational Trust	Chicago, IL

	Telephonic Town Hall Participants		
	Name	**Title & Organization**	**Location**
1	Elizabeth Mort, MD	Senior Vice President Quality & Safety, Chief Quality Officer, MGH/MGPO	Boston, MA
2	Thomas Sequist, MD, MPH	Chief Quality and Safety Officer, Partners HealthCare	Boston, MA

Telephonic Town Hall Participants			
	Name	**Title & Organization**	**Location**
3	J. Matthew Austin, PhD	Assistant Professor, Department of Anesthesiology and Critical Care Medicine and the Armstrong Institute for Patient Safety and Quality, Johns Hopkins University School of Medicine	Baltimore, MD
4	Thomas Ebert, MD	Executive Vice President and Chief Medical Officer, Fallon Health	Worcester, MA
5	Elizabeth A. R. Smith, MD, MMM	Vice President of Medical Operations, Allina Health Group	Minneapolis, MN
6	Pamela B. Siren, RN, MPH	Vice President, Enterprise Clinical Quality, AmeriHealth Caritas	Philadelphia, PA

Appendix B: Interview Guide

The following interview guide was used for the telephonic town hall meeting exploring issues related to disparities in diagnostic error (DE) and medication safety in the home (MSH). These questions were adapted and used for the key informant interviews in DE and MSH as well.

Telephonic Town Hall Meeting
Disparities in Diagnostic Error and Medication Safety in the Home
The Gordon and Betty Moore Foundation
Facilitator: Dr. Joseph Betancourt

Questions for Group Discussion

I.   **DIAGNOSTIC ERROR**

1. What are some of the key factors that may be driving disparities in diagnostic error?
    a. For racial and ethnic minority populations?
    b. For patients with limited English proficiency?

2. The literature on diagnostic error shows that few reliable measures exist, and error is largely identified in retrospect, via autopsy.
    a. How are organizations currently tracking and reporting data on diagnostic errors?
    b. How is the quality realm moving toward creating measures for diagnostic error?
    c. What additional steps could be taken to improve how diagnostic error is tracked?

3. What do you see as the key barriers to addressing disparities in diagnostic errors?

4. What can healthcare organizations with limited resources do to address disparities in diagnostic errors?

5. What thoughts or ideas do you have in terms of additional steps that could be taken to improve identifying and addressing disparities in diagnostic error?
    a. Tools for tracking diagnostic errors and disparities?
    b. Training for staff/providers?
    c. Other initiatives for staff, providers, and/or patients?

6. What are the key gaps and areas of additional research that would assist in further understanding and addressing disparities in diagnostic error for diverse populations?

7. In addition to funding for additional research in this area, what opportunities for improvement would be best served with additional funding support?

8. Please describe any promising practices, interventions, or initiatives are you aware of related to addressing disparities in diagnostic error.

II. **MEDICATION SAFETY IN THE HOME**

1. Please explain the key factors that may be driving disparities in medication safety in the home for diverse populations.
    a. There is limited literature directly related to language and medication error in the home. Please describe the barriers to medication safety in the home for patients with limited English proficiency.

2. How are organizations currently tracking and reporting data on medication safety or medication errors in the home?
    a. What steps could be taken to improve how organizations track and address this?

3. What do you see as the key barriers to addressing disparities in medication safety in the home?

4. What can healthcare organizations with limited resources do to address disparities in medication safety in the home?

5. What thoughts or ideas do you have in terms of additional steps that could be taken to improve identifying and addressing disparities in medication safety?
    a. Tools for tracking medication safety events?
    b. Training for staff/providers?
    c. Other initiatives for staff, providers, and/or patients?

6. What are the key gaps and areas of additional research that would assist in further understanding and addressing disparities in medication safety in the home for diverse populations?

7. In addition to funding for additional research in this area, what opportunities for improvement would be best served with additional funding support?

8. Please describe any promising practices, interventions, or initiatives are you aware of related to addressing disparities in medication safety in the home.