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Preventing Medication Errors

2.0 Contact Hours

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(This course is Florida Board Approved to meet the two hour requirement relating to prevention of medical errors.)

OBJECTIVES

After completing this course, the participant will be able to:

- Identify causes of medication errors.
- Describe ways to prevent common medication errors.
- Explain ways patients can help protect themselves from medication errors.

Estimates show hospital patients are subjected to an average of one medication error daily (Committee on Identifying and Preventing Medication Errors Board on Health Care Services, 2007). It is estimated that 380,000 to 450,000 injuries due to medication errors occur in hospitals each year. As many as 800,000 preventable adverse reactions due to medication errors occur in long-term care facilities.

Medication errors take a toll on everyone. This course will look at the problem of medication errors. After completing the course, participants should understand the scope of the issue and comprehend strategies for error reduction that can be implemented in a variety of health care settings.

Medical Error: *any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer. Such events may be related to professional practice, health care products, procedures, and systems, including prescribing; order communication; product labeling, packaging, and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use."*
(The National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP), 1998-2010)

WHAT ARE MEDICATION ERRORS AND WHY DO THEY HAPPEN?

The National Coordinating Council for Medication Error Reporting and Prevention defines a medication error as "any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer. Such events may be related to professional practice, health care products, procedures, and systems, including prescribing; order communication; product labeling, packaging, and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use" (The National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP), 1998-2010).

Case Report

"I gave the wrong patient the wrong medication, I did a stupid thing by carrying two patients meds at the same time. This patient happened to be a chronic pain patient, knew the medication wasn't for him but accepted the medication anyway. The medication was Percocet 5/325. I alerted my charge nurse right away, told the doctor (who started laughing and told me not to worry about it because this patient was on so many meds the Percocet wouldn't do anything to him), and wrote out the incident report" (NYCRN05, 2006).

A nurse in her first year of practice wrote the above account. Although inexperience may play a role, it is a common error when nurses are rushed, interrupted or inattentive and the system fails to create safety mechanisms to minimize the error potential. The system again fails if the incident is treated lightly and proactive steps are not taken to prevent future occurrences.

A variety of strategies and techniques have been developed and shown to help reduce medication errors. One of the first steps involves developing a model of healthcare that is a partnership between patients and their health care providers. Historically, the US health care system has been provider-centric. Patients need to be encouraged and allowed to take a more active role in their own medical care.



FACTORS THAT CONTRIBUTE TO THE HIGH MEDICATION ERROR RATE

Case Report

"I received a report from the step-down unit, I was told my patient had not received his evening dose of Coumadin. When the patient came up to the floor I looked in his file to see if the Coumadin had been given, I couldn't find the documentation in the usual place so I called the nurse back in an attempt to find out whether it had been given or not. I later found out I was connected to another nurse, who had also given me report that same night on a different patient, who told me she had not given the Coumadin. I gave the patient 5mg Coumadin and then found out the original nurse had already given the 5mg!" (NYCRN05, 2006).

This example demonstrates several critical areas in which communication breakdown and lack of proper documentation led to a potentially serious medication error. Although the nurse was diligent to call back the transferring nurse to determine if a medication was given, proper identification of the patient and nurse was not established. Administration of the medication was not properly documented, which along with the verbal report, led to further miscommunication. The system in place for reporting and documenting medication dispensing was inadequate which increased the potential for error.

Numerous factors contribute to medication missteps, ranging from human errors and system failures to compliance with policies and procedures. The American Hospital Association, as reported by the FDA, lists the following as common types of medication errors:

1. Incomplete patient information, e.g., incomplete list of patients' allergies and/or medications, previous diagnoses, and lab results
2. Unavailable drug information, e.g., lack of up-to-date warnings
3. Miscommunication of drug orders, which can involve poor handwriting, confusion between drugs with similar names, misuse of zeroes and decimal points, confusion of metric and other dosing units, and inappropriate abbreviations
4. Lack of appropriate labeling, e.g., a drug prepared and repackaged into smaller units
5. Environmental factors, e.g., lighting, heat, noise, and interruptions that can distract health professionals from their medical tasks

(U.S. Food and Drug Administration, 2010)

According to FDA data, common reported causes of medication error include:

1. Communication Errors: verbal and written miscommunication and misinterpretation of orders
2. Name Confusion: different drugs with similar names
3. Labeling issues: manufacturer, distributor, repackaging and practitioner labeling errors as well as errors in printed or electronic reference materials
4. Human factors: knowledge deficits, performance deficits, miscalculation of dosages or infusion rates, preparation errors, transcription errors, fatigue and computer errors
5. Packaging/Design issues: inappropriate packaging or design, dosage form (tablet/capsule) confusion and device issues related to package design

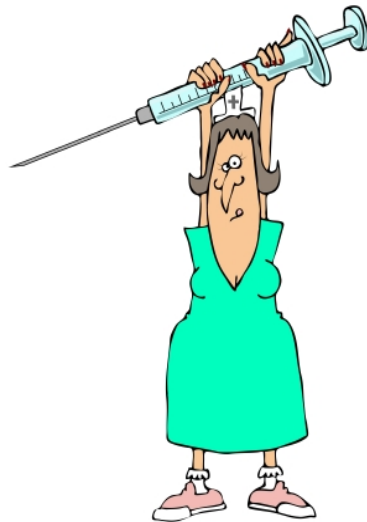
(U.S. Food and Drug Administration, 2010)



MEDICATION ERRORS AND ADVERSE EVENTS

Medication errors and adverse events range in severity from slight to fatal. Examples of these include:

- Deteriorated drugs (outdated, improperly stored, unstable solutions when reconstituted)
- Dose omission or extra doses
- Monitoring errors (improper or lack of documentation, tracking of incidents)
- Improper handling (sterile technique lapses, lack of hand washing, improper site prep)
- Noncompliance
- Over-dosage or under-dosage
- Wrong dosage form, drug, duration, patient, rate, route of administration, strength/concentration, technique, or time



GETTING FROM DIAGNOSIS TO SAFE DELIVERY

Medication delivery in the hospital setting includes multiple steps. Each step contains the potential for error:

1. Prescribing
 - assessing the need for and selecting the correct drug
 - individualizing the therapeutic response
 - designating the desired therapeutic response
2. Dispensing
 - reviewing the order
 - processing the order
 - compounding and preparing the drug
 - dispensing the drug in a timely manner
3. Administering
 - administering the right medication to the right patient
 - administering medication when indicated
 - informing the patient about the medication
 - including the patient in administration
4. Monitoring
 - monitoring and documenting patient's response
 - identifying and reporting adverse drug events
 - reevaluating drug selection, regimen, frequency and duration
5. Systems and Management Control
 - collaborating and communicating amongst caregivers
 - reviewing and managing patient's complete therapeutic drug regimen

(Nadzam, 1991)

NAMING, LABELING, AND PACKAGING ISSUES

Medication errors can be caused by naming, labeling, and packaging issues. For example:

- Brand names that look alike or sound alike such as Cerebryx (fosphenytoin) and Celexa (citalopram)
- Generic names that look alike or sound alike such as Amrinone and Amiodarone
- Different formulations with the same brand name such as Dulcolax (bisacodyl -- a stimulant laxative) and Dulcolax (docusate -- a stool softener)
- Different formulations of a generic drug. Four different versions of amphotericin B products are on the market:
 - amphotericin B (Amphocin, Fungizone, and a generic)
 - amphotericin B cholesteryl sulfate complex (Amphotec)
 - amphotericin B lipid complex (Abelcet)
 - amphotericin B liposomal (AmBisome)
- Multiple abbreviations to represent the same concept. Extended-release drugs use multiple suffixes (e.g., LA, XL, XR, CC, CD, ER, SA, CR, XT, SR) some with slightly different, but not always clear, meanings.
- Word derivatives or abbreviations can be confusing. Similar prefixes can be confused (e.g., chlor-, clo-). Abbreviations such as AD (aura dexter or right ear) can be confused with "as directed."
- Unclear dose concentration/strength designations. A 20 ml, 40 mg/ml gentamicin vial can be mistaken for a 40 mg/ml vial single dose.
- Lack of terminology standardization. Use of the term "concentrate" is inconsistent among manufacturers.
- Use of symbols such as the ampersand (&) and the slash (/) can be misidentified as numbers.
- Cluttered labeling and unclear fonts result in poor readability. Serif typeface is more difficult to read correctly than sans serif. Many people have difficulty reading cluttered labels.
- Lack of adequate background contrast. Drug information printed directly on a clear product container can be extremely difficult to read and violate industry standard (See ASTM D4267 online for details on medication labeling standards). Depending on the color of the print, the background, and the lighting conditions, labeling may be illegible.
- Warnings are nonexistent or not prominently displayed.
- Overemphasis on company logos and trade dress

REPORTING OF MEDICATION ERRORS

Many medication errors go undocumented and unreported. When mistakes are reported it can sometimes be difficult to determine the exact cause of the error. There are several reasons healthcare providers do not come forward when medication errors occur, including: fear of lawsuits, reprimand or job loss and the notion that professionals don't make mistakes coupled with the hierarchical nature of medicine (nurses hesitate to "tell on" doctors).

Of concern, especially for institutions trying to track information regarding errors, is who has access to the information. All information gathered has to be handled carefully to ensure compliance with HIPAA and all federal, state, local and industry standards and regulations.

The FDA tracks reported medication errors.

Information on voluntary reporting can be found on the FDA website at:

<http://www.fda.gov/Safety/MedWatch/HowToReport/default.htm>

It is important that errors be reported; without an understanding of the scope and nature of medication errors it is impossible to correct the problem.

STRATEGIES TO PREVENT MEDICATION ERRORS

When seeking to prevent medication errors, it is important to work on multiple levels, including, but not limited to:

- Education
- System performance - Education will not solve the problem if the system does not support the process.
- Compliance - The system and education won't be effective if compliance is not enforced.
- Individual performance - Healthcare providers who repeatedly put patients at risk out of negligence or incompetence should be held responsible for their actions.

Case Report

“I received report from one of the nurses on my floor that my patient’s Unasym had been discontinued and the patient now had an order for Penicillin Q24hr, when I looked in the MAR, I saw the registrar had picked up the order as Q24hr also, I signed off in the patients chart right under the registrars signature. To make a long story short, next day I received a call from the charge nurse on days alerting me to the fact that the patient had missed 3 doses of her penicillin because it was ordered for Q4h!” (NYCRN05, 2006).

Although the nurse may have had a knowledge deficit as to the proper drug dosing, the system also failed to flag an obvious error. In addressing this incident, an education process is indicated as well as reviewing the system for recording and reviewing medication orders.

A solid body of evidence points to medication error as a significant source of preventable error in hospitals. A number of organizations have published prevention strategies for reducing medication errors in hospitals. These strategies include:

BAR CODING

Putting supermarket-style bar coding on patient wristbands and drug dispensers can reduce mistakes. The FDA has had rules in place for the implementation of bar coding and electronic tracking for most human drug and biological products since 2004.

ELECTRONIC PRESCRIPTIONS

Electronic Prescribing or E-Prescribing reduces medication errors. Handwritten prescriptions can be difficult to decipher. In the United states, e-prescribing is promoted under the HITECH Act and standards for transmitting, recording, and describing prescriptions have been developed by the National Council for Prescription Drug Programs.

Electronic prescription systems can improve patient medical history records and flag potential problems such as drug allergies, drug-drug interactions, and excessively high doses.

ABBREVIATIONS

On both written and electronic prescriptions, abbreviations can present a risk for medication errors. In an effort to eliminate abbreviation related errors, the FDA has launched the Campaign to Eliminate Use of Error-Prone Abbreviations. For more information visit the Medication Errors page on the FDA website.

INTERRUPTIONS

Per one study, four interruptions in the course of a single drug administration doubled the likelihood that the patient would experience a major mishap. Interruptions occurred during more than half (53.1%) of all administrations, and each interruption was associated with an average 12.1% increase in procedural failures and a 12.7% increase in clinical errors. Most errors (79.3%) were minor, having little or no impact on patients. 2.7% of errors were

considered major errors, and all of them were clinical errors (Westbrook, Woods, Rob, Dunsmuir, & Day, 2010).

Designated “quiet times” where nurses are not required to attend to phone calls and other disruptive duties; and using visual clues, such as a vest, to indicate the nurse is dispensing medications, can reduce interruptions.

FATIGUE AND STRESSES

Fatigue and stress can result in errors (Garrett, 2008). Altering staffing procedures and improving working conditions can reduce fatigue and stress.

DRUGS AND EQUIPMENT

Removing concentrated and potentially lethal medications from patient care areas eliminates the possibility of someone inadvertently using a drug by mistake or not diluting it properly. Manufacturers can help by placing different concentrations of medications in distinctive packaging, such as color-coded bottles. Standardizing the functions of medical equipment used in a facility can reduce errors due to unfamiliarity with different machines or poor design.

Case Report

A highly experienced hospital nurse selected a vial of Lasix from a stock drawer containing medications and placed it in a cart. She checked the vial's label on three separate occasions before eventually administering the drug. The vial had actually contained KCL, potassium chloride, so the drug killed the patient. The vial was correctly labeled, and the nurse could not explain the lapse. There are several ways that expectation might have contributed to the errant KCL administration. The nurse had often administered KCL but had not used Lasix for almost six months. When she reached into the drawer, she simply followed her typical routine of removing the familiar KCL vial.

The series of behaviors, walking to the drawer, reaching in, and extracting a bottle had chained together to become a single response. Once initiated, it ran its familiar course. In this case, the familiar course was retrieving a vial of KCL. Expectation also prevented the nurse who administered the KCL from reading the vial's label. As a novice, she likely selected the vial and then carefully scrutinized the label. Reading print on a small vial is an arduous task requiring close attention. Most people will adapt and “cue generalize” by relying on a simpler sensory cue, selecting by familiar location in the drawer or by packing color, shape, etc. The stock drawer in the KCL incident had no dividers so the vial positions could become scrambled, possibly confusing the habit of reaching in a familiar location. The errant choice was also likely abetted by visual confusion. One study (Patient Safety, 1998) found that in several previous accidents KCL had been frequently confused with other drugs, including Lasix, due to similar packaging. The critical cause more lies in the physical environment. In the Lasix/KCL mix up, the problem was the drug storage; the stock drawer had no clear-cut dividers to separate drugs in different areas from one another. In fact, it could be questioned whether the KCL should have been in the same stock drawer at all (Green, 2004).

As demonstrated in the example above, a strategy to remove potentially lethal medications and concentrated forms of potentially lethal drugs from patient care areas eliminates the possibility of someone inadvertently using a drug by mistake or not diluting it properly.

OTHER PREVENTATIVE STEPS

- Improve error detection and reporting, and promote a non-punitive atmosphere.
- Implement standard processes for medication doses, dose timing, and dose scales in a given patient care unit.
- Use automated medication dispensing devices.
- Use pharmaceutical software.
- Implement unit dosing. Medications should be purchased in single doses packaged by the manufacturer, or they should be packaged into single doses at the central pharmacy. Unit dosing reduces the amount of handling of a drug, thereby reducing potential for errors.
- Monitor for look-alike and sound-alike medications.
- Establish a controlled formulary in which the selected medications are based more on safety than on cost.
- Have the central pharmacy supply high-risk intravenous medications and pharmacy-based admixture systems.
- Include a pharmacist during rounds of patient care units.
- Utilize pharmacist counseling of patients.
- Have a pharmacist available on call after hours of pharmacy operation.
- Have a pharmacist review all medication orders before first doses.
- Make relevant patient information available at the point of patient care.

Case Report

Changing the look of a label can mean saving lives. A study published in the *Journal of Patient Safety* in 2015 found that opaque, white 2-sided medication labels on IV bags and the use of inverted text for highlighting key medication information on the label reduced error rates in real-world, high-stress situations.

In the simulation, participants providing anesthesia in an operating room were asked to administer hetastarch to simulated patients. The fluid drawer of the anesthesia cart contained three 500-ml intravenous bags of hetastarch and one 500-ml intravenous bag of lidocaine. The bags had either the new, opaque labels or traditional ink on the clear bag type labeling.

The study found that participants were 2.61 times more likely to select the correct bag with the new labeling, significantly reducing the potential for dangerous, even fatal medication error.

Estock, Jamie, MA, Andrew Murray, MD, Margaret Mizah, PharmD, Michael Mangione, MD, Joseph Goode, MSN, and David Eibling, MD. "Label Design Affects Medication Safety in an Operating Room Crisis: A Controlled Simulation Study." *Journal of Patient Safety* (2015): n. pag. 07 Mar. 2015.

WHAT CONSUMERS CAN DO TO AVOID MEDICATION ERRORS

Patients have a responsibility to advocate for their own safe healthcare. Each person should be encouraged to take an active role in becoming informed and educated regarding his or her medical condition, treatment and medications as well as reliable sources of healthcare information. Patients need to understand their rights as a patient to have adequate explanations, instruction and time to ask questions.

RECOMMENDATIONS FOR PATIENTS

- Maintain a list of prescription drugs, nonprescription drugs and other products, such as vitamins and minerals, being taken.
- Present a copy of the list of medication when visiting a healthcare provider.
- When receiving a new medication, have the prescriber write down the name of the medication (brand and generic, if available), what it is for, its dosage, and how often to take it. Have the prescriber explain how to use the drug properly, the potential side effects, and what should be done if a side effect occurs. Ask for additional written information.
- Make sure the name of the drug (brand or generic) and the directions for use received at the pharmacy are the same as those written by the prescriber.
- Review medications with the pharmacist for additional safety and ask the pharmacist to explain how to properly take the drug, the side effects and what to do if side effects are experienced. Ask the pharmacist for written information about the medication.
- Patients should ask the doctor or nurse what medications they are receiving and why.

- Prior to surgery, ask whether there are medications that should be taken or if routinely prescribed medications should be discontinued pre-operatively.
- Prior to discharge, ask for a list of medications to be taken at home, have a provider review them and assure full understanding of the medication regimen.

(Committee on Identifying and Preventing Medication Errors Board on Health Care Services, 2007)

CONCLUSION

Medication errors represent a significant healthcare threat, costing billions of dollars and inflicting undue harm. Addressing this issue is complex and requires diligence on the part of every healthcare provider, facility and industry. When seeking to prevent medication errors, the process requires identifying the areas where missteps most often occur, assessing the root causes, developing strategies to address the underlying issues, implementing safety systems to help prevent errors and to institute continuous monitoring of the outcomes. In analyzing root causes, it is imperative to properly address the problems in terms of individual performance, system performance, compliance or any combination thereof for optimum success.



RESOURCES

FDA Page on Medication Errors

<http://www.fda.gov/Drugs/DrugSafety/MedicationErrors/default.htm>

ISMP's List of Error-Prone Abbreviations, Symbols, and Dose Designations

<http://www.ismp.org/tools/errorproneabbreviations.pdf>

CDC Page on Therapeutic Drug Use

<http://www.cdc.gov/nchs/fastats/drugs.htm>

The National Coordinating Council for Medication Error Reporting and Prevention

<http://www.nccmerp.org/>

Institute of Medicine

<http://iom.edu/>

Institute for Safe Medication Practices

<http://www.ismp.org/>

The United States Pharmacopeia

<http://www.usp.org/aboutUSP/>

American Hospital Association

<http://www.aha.org/>

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CE Exam

Preventing Medication Errors

Please complete the following examination by choosing one best answer for each question.

- 1) What percentage of the US population took a prescription medication at least once in a given month as of 2006?
 - a. 0%
 - b. 23%
 - c. 47%
 - d. 68%

- 2) On average, how often will a hospital patient experience a medication error?
 - a. Once per day
 - b. Once per week
 - c. Once per month
 - d. Once per year

- 3) On prescriptions, it is better to abbreviate common terms since abbreviations are universal.
 - a. True
 - b. False

- 4) Communication errors are a common cause of medication errors.
 - a. True
 - b. False

- 5) The FDA monitors reports of medication errors from
 - a. United States Pharmacopeia (USP)
 - b. Institute for Safe Medication Practices (ISMP)
 - c. US Institute of Highway Safety
 - d. A and B

- 6) One way to reduce medication errors is to standardize medical equipment.
 - a. True
 - b. False
- 7) Manufacturer's labeling can lead to medication errors by having
 - a. Brand names that look or sound alike
 - b. Unclear dose concentration
 - c. Cluttered labeling, small fonts
 - d. All of the above
- 8) Which is NOT a benefit of printing bar-codes on medications?
 - a. Allows electronic tracking of medication delivery
 - b. Can reduce medication errors
 - c. Helps attorneys prosecute nurses for medication errors
 - d. Assures the right patient gets the right medication at the right time
- 9) Drugs that should be handled with special care, due to their high risk of causing death or serious harm when administered incorrectly, include which of the following?
 - a. Chemotherapeutic agents
 - b. Potassium chloride
 - c. Insulin
 - d. Warfarin
 - e. All of the above
- 10) Patients have a right to know what kind of medication they are receiving, its potential side effects, what it looks like, and how often they should take it.
 - a. True
 - b. False

- 11) Concentrated solutions of hazardous medications
 - a. Should not be stored on patient care units
 - b. Should be stored in prescribed patient's drawer
 - c. Do not pose a risk to patients
 - d. Only pose a risk to small children
- 12) Patients cannot do anything to prevent medication errors.
 - a. True
 - b. False
- 13) Hospitals can use computer systems to
 - a. Reduce communication errors due to unclear handwriting
 - b. Help flag improper drug doses
 - c. Alert health care providers of potential allergic reactions
 - d. All of the above
- 14) Standardizing processes for medication doses, dose timing, and dose scales in a given patient care unit is one of the most effective ways to prevent medication errors.
 - a. True
 - b. False
- 15) Consumers can avoid medication errors by
 - a. Instructing the Emergency Department to contact their primary physician to get their list of medications
 - b. Taking medications as directed and not asking questions, more information is to confusing
 - c. Ask the doctor or nurse what medications they are receiving and why.
 - d. Only taking medications recommended on the internet



Evaluation
Preventing Medication Errors

Your opinion is important to us. Please answer the following questions by circling the response that best represents your experience.		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
COURSE OBJECTIVES & CONTENT						
1.	The activity was valuable in helping me achieve the stated learning objectives.	5	4	3	2	1
2.	The content was up to date.	5	4	3	2	1
2.	The number of credit hours was appropriate for the content.	5	4	3	2	1
TEACHING/LEARNING METHODS						
4.	The teaching/learning methods, strategies, and slides were effective in helping me learn.	5	4	3	2	1
5.	The material was clearly explained.	5	4	3	2	1
6.	The answers to the post-test questions were appropriately covered in the activity.	5	4	3	2	1
OVERALL ACTIVITY						
7.	The online course/download supported the achievement of the stated learning objectives.	5	4	3	2	1
8.	The material was relevant to my professional development.	5	4	3	2	1
9.	Overall, I am pleased with this activity and would recommend it to others.	Yes	No			
10.	The content was presented free of commercial bias. *	Yes	No			
11.	Did the material presented increase your knowledge and/or understanding of this topic? *	Yes	No	NA		

Continued on Next Page

* If you responded "No" to question 10, please explain why:

* If you answered "Yes" to question 11, what change do you intend to make?

What barrier, if any, may prevent you from implementing what you learned?

Cite one new piece of information you learned from this activity:

Additional comments/suggestions:

With my signature I confirm that I am the person who completed this independent educational activity by reading the material and completing this self evaluation.

Signature _____ Date: _____



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This course is Florida Board approved to meet the two hour requirement relating to prevention of medical errors.

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UNDERSTANDING IMPLICIT BIAS

The goal of healthcare is to provide the best possible care to all patients; indeed, many healthcare professionals must recite a pledge similar to the Hippocratic oath upon licensure. However, it is possible for healthcare professionals to have implicit bias that leads to substandard care.

Implicit bias is an unconscious attitude leading to stereotypes that influence thought and action. Not being aware of this bias can lead to unintentional discrimination in patient assessment and diagnosis, treatment, follow-up care, etc. Discrimination, unconscious or otherwise, in these impacted areas of healthcare leads to disparities where disadvantaged patient populations receive unequal care. Patient groups especially at risk of receiving unequal care may include:

- Those with lower income
- Women
- Minorities
- Those who speak English as a second language
- The elderly

An example of healthcare disparities can be seen in breast cancer mortality rates. Black women are 41% more likely to die from breast cancer than white women. Additionally, they are less likely to be diagnosed with stage I breast cancer, but twice as likely to die from early breast cancer.

Eliminating implicit bias can help reducing disparities in healthcare. Strategies for healthcare professionals to remove bias from their practice may include:

- Regulating emotions – being aware of, and control, thoughts and feelings
- Building partnerships – working with patients to achieve a common goal
- Taking perspective – understand the patient perspective during all phases of healthcare

Recognizing implicit bias and working to remove it from practice will help healthcare professionals to give the best care possible to all patients and reduce the disparities between patient populations.

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