PENNSYLVANIA PATIENT SAFETY ADVISORY

PATIENT SAFETY AUTHORITY
An Independent Agency of the Commonwealth of Pennsylvania

Produced by ECRI Institute and ISMP under contract to the Pennsylvania Patient Safety Authority

Vol. 13, No. 2

June 2016

REVIEWS & ANALYSES

42 **Newborns Pose Unique Identification Challenges**
Unique characteristics of the newborn population pose challenges for accurate and consistent patient identification. Newborns are unable to actively participate in confirming this information and often lack distinguishing physical characteristics. Safety huddling, distinct naming systems, clinician awareness, and technology such as bar coding may help to decrease newborn identification errors.

50 **Update on Medication Errors Associated with Incorrect Patient Weights**
When errors occur during the process of obtaining, documenting, and communicating and using a patient's weight, the dose of a medication can be dangerously incorrect. Important risk-reduction strategies include obtaining a current, accurate weight and obtaining, documenting, and communicating patient weights in metric units.

58 **Health Literacy and Patient Safety Events**
The Pennsylvania Patient Safety Authority is participating in a statewide health literacy initiative focused on providing strategies to healthcare providers that help patients understand and engage in their medical care. Structuring and presenting healthcare information that aligns with a patient's level of understanding can help patients achieve optimal outcomes.

FOCUS ON INFECTION PREVENTION

66 **Scabies: Strategies for Management and Control**
Scabies is a highly contagious parasitic infestation of the skin and a clinically significant cause of morbidity, especially among people who are debilitated, immunocompromised, institutionalized, or elderly. The key element to avoiding scabies outbreaks and treatment failures is a working knowledge of current scabies clinical indicators, surveillance, transmission, diagnosis, treatment, and control measures.

74 **Data Snapshot: *Clostridium difficile* Infections in Long-Term Care Facilities**

UPDATE

77 **Update on Wrong-Site Surgery: Use Patient Engagement to Enhance the Effectiveness of the Universal Protocol**

OTHER FEATURES

41 **Innovation is Key to Ongoing Success**

76 **Saves, Safety II, and System Improvements**

79 **That Pesky Human Factor**

CORRECTION

80 **Preoperative Screening and the Influence on Cancellations and Transfers: An Ambulatory Surgical Facility Collaboration**

OBJECTIVE

The *Pennsylvania Patient Safety Advisory* provides timely original scientific evidence and reviews of scientific evidence that can be used by healthcare systems and providers to improve healthcare delivery systems and educate providers about safe healthcare practices. The emphasis is on problems reported to the Pennsylvania Patient Safety Authority, especially those associated with a high combination of frequency, severity, and possibility of solution; novel problems and solutions; and problems in which urgent communication of information could have a significant impact on patient outcomes.

PUBLISHING INFORMATION

The *Pennsylvania Patient Safety Advisory* (ISSN 1941-7144) is published quarterly, with periodic supplements, by the Pennsylvania Patient Safety Authority. This publication is produced by ECRI Institute and the Institute for Safe Medication Practices under contract to the Authority.

COPYRIGHT 2016 BY THE PENNSYLVANIA PATIENT SAFETY AUTHORITY

This publication may be reprinted and distributed without restriction, provided it is printed or distributed in its entirety and without alteration. Individual articles may be reprinted in their entirety and without alteration, provided the source is clearly attributed.

Current and previous issues are available online at http://www.patientsafetyauthority.org.

SUBSCRIPTION INFORMATION

This publication is disseminated by e-mail at no cost to the subscriber. To subscribe, go to http://visitor.constantcontact.com/d.jsp?m=1103390819542&p=oi.

INDEX INFORMATION

The *Pennsylvania Patient Safety Advisory* is indexed in NLM Catalog (http://www.ncbi.nlm.nih.gov/nlmcatalog), a service of the US National Library of Medicine and National Institutes of Health.

The *Advisory* is also indexed in the CINAHL® Plus and CINAHL Plus with Full Text databases.

CONTINUING EDUCATION

The Pennsylvania Patient Safety Authority works with the Pennsylvania Medical Society to offer AMA PRA Category 1 Credits™ for selected portions of the *Pennsylvania Patient Safety Advisory* through the online publication *Studies in Patient Safety*. Go to http://www.pamedsoc.org to find out more about patient safety continuing medical education opportunities.

The Authority also works with the Pennsylvania State Nurses Association to offer nursing continuing education credits for selected portions of the *Advisory*. Go to https://ce.psna.org/continue-education/courses/ to view the course catalog.

CONSIDERATION OF SUBMITTED MANUSCRIPTS

Manuscripts consistent with the objectives of the *Pennsylvania Patient Safety Advisory* are welcome. For information and guidance about submission and instructions for authors, please contact the editor.

Scan this code with your mobile device's QR reader to subscribe to receive the Advisory for free.

PATIENT SAFETY AUTHORITY

Board of Directors

Rachel Levine, MD, *Chair*
Radheshyam M. Agrawal, MD
Jan Boswinkel, MD
John Bulger, DO, MBA
Daniel Glunk, MD
Lorina Marshall-Blake
Cliff Rieders, Esq.
Stanton Smullens, MD
Eric H. Weitz, Esq.

Staff

Regina M. Hoffman, MBA, BSN, RN, CPPS, *Executive Director*
Michelle Bell, BSN, RN, FISMP, CPPS, *Director of Outreach and Education*
Christina Hunt, MBA, MSN, RN, HCM, CPPS, *Director of Collaborative Programs*
Howard Newstadt, JD, MBA, *Finance Director/CIO*
Megan Shetterly, MS, RN, CPPS, *Senior Patient Safety Liaison*
JoAnn Adkins, BSN, RN, CIC, *Infection Prevention Analyst*
Jeffrey Bomboy, BS, RN, CPPS, *Patient Safety Liaison*
Kelly R. Gipson, BSN, RN, CPPS, *Patient Safety Liaison*
Rebecca Jones, MBA, BSN, RN, CPHRM, CPPS, *Patient Safety Liaison and Special Assistant to the Executive Director*
Richard Kundravi, BS, *Patient Safety Liaison*
Melanie A. Motts, MEd, BSN, RN, *Patient Safety Liaison*
Terri Lee Roberts, BSN, RN, CIC, FAPIC, *Infection Prevention Analyst*
Robert Yonash, RN, CPPS, *Patient Safety Liaison*
Teresa Plesce, *Office Manager*
Karen McKinnon-Lipsett, *Administrative Specialist*
Shelly M. Mixell, *Executive Director Assistant*

Contact Information

333 Market Street, Lobby Level
Harrisburg, PA 17120
Telephone: 717-346-0469
Fax: 717-346-1090
Website: http://www.patientsafetyauthority.org
E-mail: patientsafetyauthority@pa.gov

PENNSYLVANIA PATIENT SAFETY ADVISORY

Ellen S. Deutsch, MD, MS, FACS, FAAP, CPPS, *Editor*
John R. Clarke, MD, *Editor Emeritus*
William M. Marella, MBA, MMI, *Program Director*

Analysts

Theresa V. Arnold, DPM, *Manager, Clinical Analysis*
Sharon Bradley, RN, CIC
James Davis, MSN, RN, CCRN, CIC, FAPIC
Michelle Feil, MSN, RN, CPPS
Edward Finley, BS
Lea Anne Gardner, PhD, RN
Michael J. Gaunt, PharmD
Matthew Grissinger, RPh, FISMP, FASCP
Mary C. Magee, MSN, RN, CPHQ, CPPS
Christina Michalek, BSc Pharm, RPh
Susan C. Wallace, MPH, CPHRM

Advisors

Michael Cohen, ScD, MS, RPh, *President, ISMP*
Ronni Solomon, JD, *Executive Vice President and General Counsel, ECRI Institute*
Allen Vaida, PharmD, *Executive Vice President, ISMP*

Production Staff

Jesse Munn, MBA, *Managing Editor*
Julia Barndt, MA
Eloise DeHaan, ELS
Susan Lafferty
Dawn Thomas
John Hall, *Manager, Printing Services*
Tara Kolb, BFA, *Manager, Media Services*
Kristin Finger, BS
Suzanne R. Gehris
Benjamin Pauldine, MS

Contact Information

Mailing address: PO Box 706
Plymouth Meeting, PA 19462-0706
Telephone: 866-316-1070
Fax: 610-567-1114
E-mail: support_papsrs@pa.gov

Editorial Advisory Board

Mary Blanco, MSN, RN, CPHQ, *Brandywine Hospital*
Lawrence M. Borland, MD, *Children's Hospital of Pittsburgh of UPMC*
Dorothy Borton, BSN, RN, CIC, *Einstein Healthcare Network*
Albert Bothe Jr., MD, *Geisinger Health System*
Mark E. Bruley, BS, CCE, *ECRI Institute*
Vincent Cowell, MD, *Temple University*
Frank M. Ferrara, MD, MBA, *Wills Eye Surgery Center-Plymouth*
Caprice C. Greenberg, MD, MPH, *University of Wisconsin*
Daniel Haimowitz, MD, FACP, CMD
Mary T. Hofmann, MD, *Abington Hospital–Jefferson Health*
Janet Johnston, JD, MSN, RN
Sandra Kane-Gill, PharmD, MSc, FCCM, FCCP, *University of Pittsburgh School of Pharmacy*
Harold S. Kaplan, MD, *Mount Sinai School of Medicine*
Michael L. Kay, MD, *Wills Eye Hospital, Thomas Jefferson University Hospital, Pennsylvania Hospital*
John J. Kelly, MD, FACP, *Abington Hospital–Jefferson Health*
Curtis P. Langlotz, MD, PhD, *University of Pennsylvania*
Michael Leonard, MD, *Kaiser Permanente, Institute for Healthcare Improvement*
James B. McClurken, MD, FACC, FCCP, FACS, *Temple University*
Patrick J. McDonnell, PharmD, *Temple University School of Pharmacy*
Dwight McKay
Francine Miranda, BSN, RN, FASHRM, *Lehigh Valley Hospital*
Dona Molyneaux, PhD, RN, *Gwynedd-Mercy College*
Gina Moore, BSN, RN, CPHQ, *Christiana Care Health Services*
Steve D. Osborn, Vice President, *Saint Vincent Health Center*
Christopher M. Pezzi, MD, FACS, *Abington Hospital–Jefferson Health*
Eric Shelov, MD, *Children's Hospital of Philadelphia, University of Pennsylvania*
Hyagriv N. Simhan, MD, MSCR, *University of Pittsburgh*
Dean Sittig, PhD, *University of Texas*
Amy B. Smith, PhD, *Lehigh Valley Health Network*
Nielufar Varjavand, MD, *Drexel University*
Debra J. Verne, MPA, RN, CPHRM, *Penn State Milton S. Hershey Medical Center*
Linda Waddell, MSN, RN, CPPS, CJCP, *Donald D. Wolff, Jr., Center for Quality Improvement and Innovation at UPMC*
Harold C. Wiesenfeld, MD, *University of Pittsburgh*
Zane R. Wolf, PhD, RN, FAAN, *LaSalle University School of Nursing and Health Sciences*

ACKNOWLEDGMENTS

These individuals reviewed articles for Vol. 13, No. 2:

Jason Adelman, MD, MS, *Columbia University Medical Center/New York Presbyterian Hospital*
Kelly Besco, PharmD, FISMP, CPPS, *OhioHealth*
Rickie Brawer, PhD, MPH, MCHES, *Thomas Jefferson University Hospitals*
Kenneth Brubaker, MD, *Masonic Village*
Linda Chamberlain, MS, BSN, RN, PADONA
Susan Cosgrove, MPA, CPHQ, *The Health Care Improvement Foundation*
Sarah Henrickson Parker, PhD, *Virginia Tech Carilion Research Institute*
Barbara L. Olson, MS, RN, FISMP, FASMSO, *LifePoint Health*
Gautham Suresh, MD, DM, MS, FAAP, *Texas Children's Hospital*
Cynthia Wallace, BA, CPHRM, *ECRI Institute*
Zane R. Wolf, PhD, RN, FAAN, *LaSalle University School of Nursing and Health Sciences*

©2016 Pennsylvania Patient Safety Authority

Innovation is Key to Ongoing Success

Regina M. Hoffman, MBA, BSN, RN, CPPS
Executive Director
Pennsylvania Patient Safety Authority

Editor's Note

In April 2016, the Pennsylvania Patient Safety Authority Board of Directors named Regina M. Hoffman executive director of the Authority following the March retirement of its previous executive director, Michael C. Doering. Most recently, Hoffman oversaw the Authority's patient safety liaison and education programs.

I am fortunate to step into the role of executive director at a time of considerable momentum. Since its inception, the Pennsylvania Patient Safety Authority has grown in breadth and depth to provide Pennsylvania's healthcare facilities with quality patient safety resources, and it has become an esteemed leader in the field.* Much of the Authority's progress and reputation are a result of Michael Doering's forward-thinking leadership and dedication over the past nine years. During Mike's tenure, the Authority's database of patient safety events grew to one of the largest in the world, the challenge of reporting standardization was tamed, facility reporting of healthcare-associated infections and follow-up education began, a team of patient safety liaisons was formed to serve as a frontline resource to acute healthcare facilities, and collaborative work became a key service. Working with Mike was a pleasure and we all wish him happiness in his retirement.

Although Pennsylvania's healthcare facilities have made great strides in patient safety, important work still lies ahead. To adapt to the complexities and pace of change, we need to think and act differently—more so than ever before. For this reason, the Authority will seek to employ innovative strategies both internally and externally to truly move the patient safety bar to the next tier across our commonwealth. Innovation will not be an initiative for us; rather, it will serve as the foundation on which our future is built. Within the Authority, we will embrace creative problem-solving methods to spark fresh thoughts and foster an environment that encourages curiosity, ambitious ideas, and constructive change. We will use innovation to enhance our existing projects and services while pushing boundaries to help facilities develop unique insights into patient safety and discover untapped opportunities. We will continue to pursue and support collaborative relationships both within and outside of healthcare. There is much to learn from other industries; I believe they may hold the key to solving some of our most significant patient safety challenges.

I am optimistic about our future and feel confident that, with Pennsylvania healthcare facilities as our partners, we can make healthcare safer for our families, friends, and fellow commonwealth citizens. I look forward to serving in this role and encourage you to contact me at any time (reghoffman@pa.gov) with questions or suggestions for making healthcare safer for patients in Pennsylvania.

* See the Pennsylvania Patient Safety Authority's 2015 annual report, http://patientsafetyauthority.org/PatientSafetyAuthority/Documents/annual_report_2015.pdf, for snapshots of the Authority's recent and overall work.

©2016 Pennsylvania Patient Safety Authority

Newborns Pose Unique Identification Challenges

Susan C. Wallace, MPH, CPHRM
Patient Safety Analyst
Pennsylvania Patient Safety Authority

ABSTRACT

Safe patient care starts with accurate patient identification. Unique characteristics of the newborn population pose challenges for accurate and consistent patient identification. Hospitalized newborns often share similar birth dates and medical record numbers and, with multiple births, even share surnames. Unlike older patients, newborns are unable to actively participate in confirming this information and often lack distinguishing physical characteristics. Pennsylvania Patient Safety Authority analysts estimate that an average of nearly two newborn misidentification events occur daily in Pennsylvania. Safety huddling, distinct naming systems, clinician awareness, and technology such as bar coding may help to decrease newborn identification errors. (Pa Patient Saf Advis 2016 Jun;13[2]:42-50.)

INTRODUCTION

Safe patient care starts with accurately identifying patients, to deliver the correct care.[1] Failing to correctly identify patients and match their identity to an intended clinical evaluation or intervention, or for administrative functions, can compromise patient safety.[2] Hospitalized newborns pose unique identification challenges because they often share similar or identical birth dates, similar medical record numbers, and, in the case of twins and multiple births, common surnames.[2]

Newborn misidentification has been reported to result in unintended procedures, such as a frenotomy (clipping of the frenulum, which connects the tongue to the floor of the mouth), performed on the wrong Tennessee newborn after a pediatrician confused him with another newborn.[3] Other examples of misidentification include two Virginia newborns who were switched at birth in 1995 and discharged to the wrong parents.[4] And a Washington, D.C., hospital nurse gave a newborn to the wrong mother, resulting in the newborn receiving formula instead of breast milk.[5]

A one-year study from Beth Israel Deaconess Medical Center in Boston found, on average, 26% of neonatal intensive care unit (NICU) newborns were at risk for being mistaken for another newborn on any given day because they had similar identifiers.[2] Health professionals from 54 hospitals in the Vermont Oxford Network reported that 11% of newborn errors over a more than two-year period involved misidentification.[6]

The Joint Commission recommends the use of at least two identifiers based on demographic information, such as the patient name, date of birth, or medical record number.[1] Unlike most patients, newborns are unable to actively participate in confirming this information and often lack distinguishing physical characteristics.[2]

Because of a scarcity of publications describing the incidence and effects of patient identification errors in newborns at a population level, analysts explored newborn identification events reported to the Pennsylvania Patient Safety Authority through its Pennsylvania Patient Safety Reporting System (PA-PSRS).

METHODS

Analysts queried the PA-PSRS database for reports of events that occurred from January 2014 through December 2015 for patients through 30 days of age using keywords including "identifier," "ID band," "patient name," "label," "another patient," "identification," and "wrong patient." In this database, events are tagged by reporting health professionals with up to seven event-type categories such as "error related to procedure/treatment/test" or "medication error."

Analysts manually reviewed the resulting set of event report narratives to identify reports describing misidentification events and grouped them into related categories. Event descriptions containing the word "twin" were also identified.

The total number of misidentified events for the two years (n = 1,234) was divided by 2 for an average number per year, and then divided by 365 days to determine average newborn misidentification events per day.

The total number of events for 2014 (n = 617) was divided by the number of 2014 births reported by the Pennsylvania Department of Health (n = 141,355)* multiplied by 1,000 to determine a rate of misidentification events per every 1,000 live births.

---

* These data were provided by the Division of Health Informatics, Pennsylvania Department of Health. The Department specifically disclaims responsibility for any analysis, interpretations, or conclusions. Data for live births in Pennsylvania for 2015 were unavailable.

©2016 Pennsylvania Patient Safety Authority

Analysts conducted a review of the literature, as well as an Internet search, to identify strategies to reduce identification errors and patient harm in healthcare facilities. Interviews with laboratory, NICU, and obstetric personnel in Pennsylvania hospitals were also conducted to identify best practices and resources developed for identification practices to reduce misidentification events.

RESULTS

Analysts identified 1,234 misidentification events occurring between January 2014 and December 2015. The identified events were submitted in seven event type categories with 80% (n = 987) reported in "error related to procedure/treatment/test," followed by 8.3% (n = 102) reported in "medication error" (Table 1).

All reported events occurred in a hospital or birthing center. Five event reports were reported as Serious Events, with assigned harm scores of E or G; these were events in which breast milk was given to the wrong patient and a circumcision was performed without consent. No harm or unsafe conditions were reported with the remainder of the events, with the majority 40.3% (n = 497) assigned a harm score of C and 37.4% (n = 462) assigned a harm score of B2* (Table 2).

Analysts grouped events into four categories, based on event report narrative descriptions (see Figure).

The majority of the misidentification events (n = 917, 74.3%) involved procedure errors, including mislabeled blood specimens, unlabeled urine samples, wrong patient respiratory reports, and wrong patient radiographs. The next largest category was general misidentification events (n = 118, 9.6%), including no identification band on patient and mismatched identification bands on mother and newborn; documentation practices, such as another patient's consent in the medical record; and transferring issues such as the wrong newborn taken to the parents. Medication events (n = 110, 8.9%) included administering the wrong drug to the patient; breast milk administration mishaps (n = 89, 7.2%) included providing the wrong breast milk to the newborn.

Events in the procedure errors grouping were separated into diagnostic areas impacted by the misidentification: laboratory, radiology, surgical, and respiratory. The word "twin" was documented in 3.3% (n = 41 of 1,234) of the events.

Analysts estimated that 1.7 or nearly 2 newborn misidentification events occur daily in Pennsylvania, impacting 4.6 newborns per every 1,000 births or 1 newborn for every 217 live births.

Table 1. Newborn Misidentification Events Reported to the Pennsylvania Patient Safety Authority, by Event Type,* January 2014 through December 2015 (N = 1,234)

EVENT TYPE	NO. (%) OF EVENTS
Error related to procedure, treatment, or test	987 (80.0)
Medication error	102 (8.3)
Complication of procedure, treatment, or test	28 (2.3)
Transfusion	25 (2.0)
Skin integrity	1 (0.1)
Equipment, supplies, or device	1 (0.1)
Other	90 (7.3)

* Event types are defined by Pennsylvania Patient Safety Reporting System taxonomy and are assigned to events by healthcare facilities at the time of report submission. Total percentage listed is greater than 100% due to rounding.

Table 2. Newborn Misidentification Events Reported to the Pennsylvania Patient Safety Authority, by Event Harm,* January 2014 through December 2015 (N = 1,234)

HARM SCORE	NO. (%) OF EVENTS
Incident: Unsafe conditions (harm score A)	93 (7.5)
Incident: No harm (harm scores B1 through D)	1,136 (92.1)
Serious Event: Temporary harm (harm scores E through F)	4 (0.3)
Serious Event: Significant harm (harm scores G through I)	1(0.1)

* Event harms are defined by Pennsylvania Patient Safety Reporting System taxonomy and are assigned to events by healthcare facilities at the time of report submission.

Newborn Misidentification Events

Procedure errors. Examples of events reported to the Authority involving diagnostic misidentification events are as follows:†

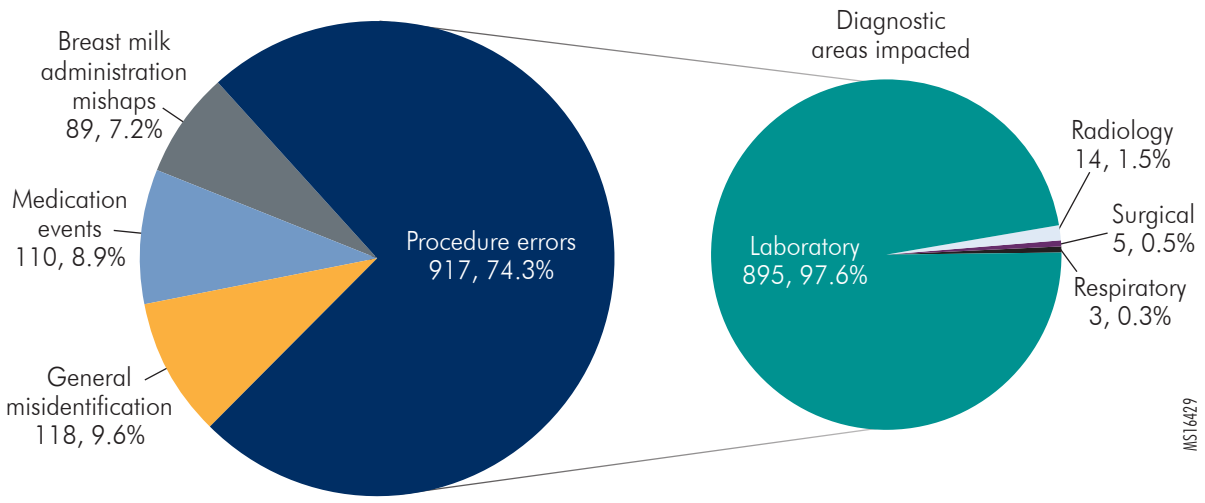
> *Another nurse picked up the printed cord blood labels for this delivery and*

* The Pennsylvania Patient Safety Authority Harm Score Taxonomy is available online at http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2015/mar;12(1)/PublishingImages/taxonomy.pdf.

† The details of the PA-PSRS event narratives in this article have been modified to preserve confidentiality.

©2016 Pennsylvania Patient Safety Authority

Figure. Misidentification Error Types, January 2014 through December 2015, as reported to the Pennsylvania Patient Safety Authority (n = 1,234)*



***Total percentage listed is less than 100% due to rounding.**

used them for the specimens from a previous delivery without verifying the name on the label. The primary nurse for this delivery called the lab to reproduce cord blood labels, believing the printer did not print them. Both specimens were sent with the same label.

There were two baby girls with the same last name in the unit. An x-ray was ordered on the wrong patient but was performed on the correct patient.

General misidentification events. Examples of events reported to the Authority involving general misidentification events, are as follows:

Patient did not have an identification band. It was taped to the bassinet and mother reports staff scanned the taped ID band.

Patient had the wrong identification band. It contained the right name but another patient's birth date. The staff had used the ID band for several days.

Phlebotomist was in the NICU to draw blood from a baby. When she looked at the baby's name band on the wrist it said a different name. She notified the nursing staff that it was the incorrect baby. The resident in the room stated it was the right baby. She then told them the name on the band was not the name on her requisition. The nurse checked and confirmed the baby in fact had the incorrect band on. It was removed, and the phlebotomist states the nurses were trying to figure out if another baby had the incorrect band and how to correct the mistake.

Medication events. Examples of events reported to the Authority involving medication misidentification events, are as follows:

Antibiotic order faxed to pharmacy. When entering the order, pharmacist noted this patient's weight was significantly different from the weight on the order (2.185kg vs. 0.83kg). The pharmacist found that the sticker on the antibiotic order was incorrect. There are currently two patients with the same last name.

Lasix [furosemide] ordered on wrong baby in NICU. Error caught and corrected before administration.

Breast milk administration mishaps. Examples of events reported to the Authority involving breast milk misidentification events, are as follows:

Newborn baby boy given to incorrect mother for breast feeding. Staff nurse realized the mix-up and went to retrieve newborn from incorrect mother. Event discovered in short period of time. After reviewing event with the incorrect mother, it was confirmed that the baby did indeed latch on to her breast. Infection Prevention

©2016 Pennsylvania Patient Safety Authority

notified. Event was disclosed to this baby's birth mother and father.

Patient was fed breast milk that was from another patient with the same last name.

DISCUSSION

Hospitalized newborns create unique identification challenges, especially the high-risk NICU population that has prolonged lengths of stay. Analysis of PA-PSRS reveals that an average of nearly two newborn misidentification events are reported daily in Pennsylvania, including errors related to procedures, general misidentification events, medication events, and breast milk administration mishaps.

Healthcare workers perform patient identification several times a day for almost every instance of care. A medical error of identification can result if any step in this process is not properly performed.[7] Similarities in the newborn population including surnames, medical record numbers, and birth dates contribute significantly to misidentification risk. Gray and co-authors found the most common cause was similar-appearing medical record numbers, followed by identical or similar-sounding names.[2]

Voluntary anonymous reporting in the Vermont Oxford Network uncovered a broad range of medical errors affecting neonates at high risk of health problems and their families. Patient misidentification was the root cause of 11% of diagnosis, treatment, prevention, and other events.[6]

Strategies to prevent misidentification error for newborns include changing from a nondistinct naming convention (e.g., Babyboy) to a distinct naming convention that uses the mother's name and newborn's gender (e.g., Wendysboy);[8] using communication tools such as huddling and color coding for like-sounding names;[9] standardizing practices for identification banding; and using bar-code technology for patient identification for medication administration, breast milk administration, and blood collection.[10,11] Another area of discussion includes implementing national identification numbers as unique health identifiers (see "Unique Health Identifiers").

UNIQUE HEALTH IDENTIFIERS

When the Health Insurance Portability and Accountability Act of 1996 (HIPAA) was proposed by the US Department of Health and Human Services, it called for the creation of a unique health identifier (UHI); each person would be issued a unique medical identification number. Use of a UHI was never enacted because of fears of privacy and security breaches.[1]

Health providers seek ways to link patients across a burgeoning number of electronic patient information management systems, but these systems may not coordinate their patient identification processes.[2] Advocates of a UHI point to other countries, such as Australia and England and Wales, which have started their own UHI programs, including guidelines for identification of newborns.[3,4]

In the absence of consensus, information management advocates, such as the College of Healthcare Information Management Executives of Ann Arbor, MI, have called for the creation of patient identifier systems outside of federal government control.[5] Privacy advocates, such as the Patient Privacy Rights organization, support using a patient identifier on an encrypted card held by patients, who would be in control of their own health information.[6] Other systems use facial recognition authentication, palm vein recognition, and fingerprint scanning.[7]

Notes

1. US Department of Health and Human Services. Unique health identifier for individuals: a white paper [online]. [cited 2016 May 10]. https://aspe.hhs.gov/legacy-page/white-paper-unique-health-identifier-individuals-152126
2. Gliklich RE, Drey NA, Leavy MB. Registries for evaluating patient outcomes: a user's guide. 3rd ed. Agency for Healthcare Research and Quality 2014 Apr.
3. National Patient Safety Agency. NHS number to be used as the unique patient identifier by all NHS organisations in England and Wales [online]. [cited 2016 May 10]. http://www.npsa.nhs.uk/corporate/news/nhsnumber/
4. Australian Commission on Safety and Quality in Healthcare. Patient identification [online]. [cited 2016 May 10]. http://www.safetyandquality.gov.au/our-work/patient-identification/
5. College of Healthcare Information Management Executives. Leading healthcare IT association announces $1 million initiative to protect patients from life-threatening medical errors [online]. 2016 Jan 19. [cited 2016 May 10]. https://chimecentral.org/leading-hit-association-announces-1m-initiative/
6. McQuaid J. Patient mix-ups happen more often than you think. Why the easy fix isn't easy at all [online]. Statnews.com 2016 Jan 28. [cited 2016 May 10]. http://www.statnews.com/2016/01/28/patient-mixups-universal-identification/
7. Cuberos D. In your face: the future of federated patient identification [online]. Right Patient 2015 Oct 7. [cited 2016 Apr 8]. http://www.rightpatient.com/blog/the- future-of-federated-patient-identification-your-face/

Contributory Factors

Misidentifications can occur in diagnostic, therapeutic, or supportive areas of care because in some cases newborns lack facial or other distinguishing physical features (i.e., some newborns may look similar). PA-PSRS event analysis, Authority

©2016 Pennsylvania Patient Safety Authority

interviews, and a literature review isolated the following contributory factors that can lead to misidentification errors.

Documentation practices. Henneman and co-authors concluded that medical providers infrequently verify patient identification with two identifiers during computerized provider order entry.[12] Carroll and colleagues found frequent NICU documentation discrepancies in written resident progress notes, including errors in documentation of medications, vascular lines, and patient weight. Notes omitted information and documented inaccurate information.[13] In another NICU study, a serious error was caused by a documentation mistake, resulting in the wrong newborn receiving an antibiotic.[14] Computerized order entry helps decrease written documentation errors, said Vivian Haughton, MSN, Clinical Nurse Specialist, Women and Babies Hospital, Lancaster General Health. "The providers must enter orders, even remotely," she said. "Nurses do not have to interpret handwriting."[15]

Labeling errors. Breast milk and other specimens such as blood and urine require a patient-specific label. Previous work by the Authority analyzed events pertaining to mismanagement of expressed breast milk and provided information and resources about best practices.[16] Misidentified specimens create a serious risk to safety, leading to misdiagnosis and inappropriate treatment.[17] Labeling errors for blood or other specimens can occur when the labels are not readily available at the point of care. The wrong label may be used in the rush to provide a label for a specimen. For example, a cord blood specimen might mistakenly have the mother's label applied, said Barbara Booth, BS, Laboratory Service Improvement Coordinator, Geisinger Wyoming Valley Medical Center.[18] Mismanagement of breast milk can occur with the placement of the wrong label.

Patient identification band concerns. Healthcare workers help to reduce misidentification errors with placement of patient identification bands, usually on both the newborn's ankle and wrist.[10] Bands can include the patient's name, date of birth, medical record number, visit number, admission date, and physician.[19] Bands may also include technology such as barcodes that can be scanned prior to medication administration.[19] Howanitz and colleagues found patient identification band errors in up to 7.4% of all patients over a two-year period. Missing wristbands accounted for 71.6% of the errors, with the remainder involving incorrect, conflicting, or incomplete information.[20] Elizabeth Quigley, MSN, Nurse Manager Intensive Care Nursery, The University of Pennsylvania Health System, said that "barcoding is used on patient identification bands placed on the newborn's wrist and ankle. Nurses then scan the barcode when administering medication or breast milk."[9]

Registration issues. To generate orders and labels for specimens, newborns need to be registered in the electronic health record, according to Booth.[18] "Confusion around registration becomes an issue soon after birth," Booth said. "Most patients who come into the hospital are registered." She explained further: "When you have a new baby come into the world, you had one patient, now you have two. Getting that baby registered and treated as an individual is important for correct identification."[18]

Similar identifiers. Hospitals commonly provide temporary names to newborns soon after they are born, such as Babygirl Jackson or Babyboy Jones.[21] A 2013 survey of 335 NICUs showed these non-distinct names are used by more than 80% of hospitals.[22] Although this provides a quick way to assign a name for registration and patient identification bands, it also results in similar identifiers. If two newborns from different families have the same last name or if there are multiple births (e.g., twins, triplets), this can increase the presence of similar patient identifiers, including birthdates. A 2015 study published in *Pediatrics* demonstrated that replacing a non-distinct naming convention (e.g., Babyboy) with a distinct naming convention that uses the mother's first name (e.g., Wendysboy) can reduce misidentification errors by 36%.[8]

Hospitals may also provide medical record numbers in sequence.[2] The Joint Commission's Sentinel Event database reported 10 cases of wrong-person surgeries since 2010 in which circumcisions were performed on the wrong newborn because of similar identifiers.[21] "OB Safety Rounds" are conducted every four hours in the Birth Center at Magee-Womens Hospital of the University of Pittsburgh Medical Center to promote situational awareness of current issues that have the potential to impact safety, quality, and care delivery, such as identifying similar-sounding names, said Vivian Petticord, DNP, Perinatal Safety Nurse at the hospital. The around-the-clock rounds are multidisciplinary and include medical and nursing representation from anesthesia, obstetrics, and neonatology, she said. A "Stop" symbol is placed on the centralized patient board and on the patient's room if there are similar-sounding names.[23]

Limitations

This report may have limitations. Events may not have been reported as an outcome of a misidentification because it may not have been recognized at the time the event was submitted. Misidentification events may involve two newborns, (i.e., the wrong newborn gets medication, while the correct newborn misses a dose) but may have been identified in only one event report. Because of the way PA-PSRS is structured, analysts were unable to determine the causal and associated factors for the newborn identification errors that were described.

©2016 Pennsylvania Patient Safety Authority

RISK REDUCTION STRATEGIES

The following strategies may be useful to healthcare facilities seeking to reduce misidentification events for diagnostics, general identification, medication management, and breast milk administration. Some of these strategies may be considered for more than one event category.

Documentation Practices

- Make important information legible and prominent on identification bands, the electronic health record screen, and the specimen label.[12]
- Check for two patient identifiers before entering information into a medical record.[12]
- Use provider order entry systems that physicians can use in the healthcare facility or remotely.[15]
- Provide awareness to healthcare professionals of the potential for identification errors, such as pulling or entering orders in the wrong medical record.[12]

Labeling Errors

- Use identification verification technologies, such as bar coding and radiofrequency.[7]
- Use bedside label printers to generate labels at the point of care.[24]
- Collect specimens after a label is printed and at the point of care.[18]
- Use blood tube extenders or a "tube-within-a-tube" system when using microtainers, if small labels are not available.[17,18]
- Educate staff about labeling protocols and verify understanding of the correct procedure through demonstration.[25]

Breast Milk

- If auto identification technologies are not available, use nursing double checks.[16,26]
- Ask parents to participate in the double-check process.[16,26]
- Use individual warmers at the bedside to reduce opportunities for misidentification.[16,26]
- Use a freezer-safe and smudge-proof label to ensure legibility of patient identifiers.[16,26]

Patient Identification Band Concerns

- Use auto identification technologies, such as bar coding and radiofrequency.[2]
- Ensure patient identification bands are properly placed before treatment administration or diagnostic testing.[17]
- Apply newborn identification bands to two body sites, such as the wrist and ankle.[9]
- Replace identification bands if the information on them is not complete and legible.[25]
- Educate parents on the importance of maintaining patient identification bands on their newborn at all times.[6]

Band Design[19]

- Simplify unnecessary information not used for positive patient identification.
- Locate the patient identifiers in an easy-to-find place.
- Use large font sizes and readable text styles.
- Standardize information layout and presentation.
- Avoid using all capitalized letters.

Registration Issues

- Pre-register newborns with information that is known and then activate the registration with the additional information after birth.[18]
- Meet with registration departments to streamline procedures needed to place newborn information into electronic health records.[18]

Similar Identifiers

- Assign distinct first names at birth by incorporating the mother's first name into the newborn's first name, (e.g., Wendysgirl Jackson versus Babygirl Jackson).[8]
- Meet in a huddle daily or more often to acknowledge and discuss newborns who have similar-sounding names.[23]
- Place newborns with similar-sounding names in a different pod, or across the nursery or NICU.[15,23]
- Use an identifying symbol such as a star, "Stop" sign, color-coding, or plain language such as "similar name" to visually alert workers to similar-sounding names.[15,23]

CONCLUSION

Unique characteristics of the newborn population pose challenges for accurate and consistent patient identification. These can include similarities in patient identifiers such as similar names, medical record numbers, and birth dates.[2] Misidentification has contributed to wrong patient procedures, issues in breast milk mismanagement, wrong medications, and newborns switched at birth and given to the wrong parents. Unlike other populations, newborns cannot participate in the identification process and may have similar physical characteristics.[2] Authority analysts estimated that an average of nearly two newborn misidentification events occur daily in Pennsylvania, which equates to one misidentification error for every 217 live births. Safety huddling,[15,23] distinct naming systems,[8] clinician awareness, and technology such as bar coding[11] may help to decrease newborn identification errors.

©2016 Pennsylvania Patient Safety Authority

NOTES

1. The Joint Commission. National Patient Safety Goals effective January 1, 2016 [online]. 2015 [cited 2015 Mar 1]. http://www.jointcommission.org/assets/1/6/2016_NPSG_HAP.pdf
2. Gray JE, Suresh G, Ursprung R, et al. Patient misidentification in the neonatal intensive care unit: quantification of risk. *Pediatrics* 2006 Jan;117(1):437.
3. Chuck E. Tennessee mom says hospital performed procedure on wrong baby [online]. NBC News 2016 Feb 11 [cited 2016 May 9]. http://www.nbcnews.com/news/us-news/tennessee-mom-says-hospital-performed-procedure-wrong-baby-n515886
4. Kemp J. Virginia teen talks about being switched at birth, a mistake that changed security in hospitals nationwide. New York Daily News. 2013 Nov 14. [cited 2016 Mar 2]. http://www.nydailynews.com/news/national/virginia-teen-talks-switched-birth-mistake-changed-security-hospitals-nationwide-article-1.1516610
5. Tanabe K. Babies are still switched at birth? Yes, it happened to me, briefly. The Washington Post 2016 Apr 7 [cited 2016 Apr 13]. https://www.washingtonpost.com/news/parenting/wp/2016/04/07/babies-are-still-switched-at-birth-yes-it-happened-to-me-briefly/
6. Suresh G, Jorbar J, Plsek P, et al. Voluntary anonymous reporting of medical errors for neonatal intensive care. *Pediatrics* 2004 Jun 6;113(6):160918.
7. Gray JE, Goldman DA. Medication errors in the neonatal intensive care unit: special patients, unique issues. *Arch Dis Child Fetal Neonatal Ed* 2004 Nov;89:472-3.
8. Adelman J, Aschner J, Schechter C, et al. Use of temporary names for newborns and associated risks. *Pediatrics* 2015 Aug;136(2):327-33.
9. Quigley, Elizabeth (Nurse Manager, Neonatal Intensive Care Unit, Pennsylvania Hospital of the University of Pennsylvania Health System). Conversation with: Pennsylvania Patient Safety Authority. 2016 Feb 12.
10. Phillips SC, Saysana M, Worley S, et al. Reduction in pediatric identification band errors: a quality collaborative. *Pediatrics* 2012 Jun;129(6):1587-93.
11. Steele C, Bixby C. Centralized breastmilk handling and bar code scanning improve safety and reduce breastmilk administration errors. *Breastfeed Med* 2014 Nov 9(9):426-9.
12. Henneman PL, Fisher DL, Henneman EA, et al. Providers do not verify patient identity during computer order entry. *Acad Emerg Med* 2008 Jul;15(7):641-8.
13. Carroll AE, Tarczy-Hornoch P, O'Reilly E, et al. The effect of point-of-care personal digital assistant use on resident documentation discrepancies. *Pediatrics* 2004 Mar;113(3 Pt 1):450-4.
14. Simpson JH, Lynch R, Grant J, et al. Reducing medication errors in the neonatal intensive care unit. *Arch Dis Child Fetal Neonatal Ed* 2004 Nov;89(6):F480-2.
15. Haughton, Vivian (Clinical Nurse Specialist, Women & Babies Hospital, Penn Medicine, Lancaster General Health). Conversation with: Pennsylvania Patient Safety Authority. 2016 Mar 8.
16. Mismanagement of expressed breast milk. PA PSRS Patient Saf Advis [online] 2007 Jun [cited 2016 Mar 2]. http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2007/jun4(2)/Pages/46.aspx.
17. Dunn EJ, Moga PJ. Patient misidentification in laboratory medicine. *Arch Pathol Lab Med* 2010 Feb 134:244-55.
18. Booth, Barbara (Laboratory Service Improvement Coordinator, Geisinger Wyoming Valley Medical Center). Conversation with: Pennsylvania Patient Safety Authority. 2016 Mar 1.
19. Probst CA, Wolf L, Bollini M, et al. Human factors engineering approaches to patient identification armband design. *Appl Ergon* 2016 Jan;52:1-7.
20. Howanitz PJ, Renner SW, Walsh MK. Continuous wristband monitoring over 2 years decreases identification errors. *Arch Pathol Lab Med* 2002;126:809-15.
21. The Joint Commission, Division of Health Care Improvement. Temporary names put newborns at risk. Quick-Safety 2015 Oct;17;1-2 [cited 2016 Mar 9]. http://www.jointcommission.org/assets/1/23/Quick_Safety_Issue_17_Oct_2015_10_20_15.pdf
22. Adelman JS, Schechter C, Aschner J, et al. The "babyboy/babygirl" problem: evaluating the risk of non-distinct, temporary first names for newborns and measuring the effect of changing the paradigm to reduce wrong patient orders. Presented at: Vermont Oxford Network Conference; Nov 2014; Chicago, IL [online]. 2014 Nov [cited 2016 May 4]. www.vtoxford.org/meetings/AMQC/Handouts2014/LearningFair/Montefiore_BabyBoyBabyGirlIntheNICU.pdf
23. Petticord, Vivian (Perinatal Safety Nurse, Magee-Womens Hospital of the University of Pittsburgh Medical Center). Conversation with Pennsylvania Patient Safety Authority. 2016 Feb 18.
24. Reducing errors in blood specimen labeling: a multihospital initiative. Pa Patient Saf Advis [online] 2011 Jun [cited 2016 Mar 2]. http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2011/jun8(2)/Pages/47.aspx
25. Patient misidentification in the NHS is recognised as a significant risk to all groups of patient's, however certain groups of patients are more vulnerable, this include neonates. *J Neonatal Nurs* 2008 Oct.14(5):170-1
26. NSW Health. Maternity-breast milk: safe management [online]. 2010 Mar 23 [cited 2016 Mar 4]. http://www0.health.nsw.gov.au/policies/pd/2010/pdf/PD2010_019.pdf

©2016 Pennsylvania Patient Safety Authority

LEARNING OBJECTIVES

- Identify common reasons why newborn misidentification occurs.
- Recall newborn misidentification events most likely to occur as identified in events reported through the Pennsylvania Patient Safety Reporting System (PA-PSRS).
- Recall the predominant contributory factors for newborn misidentification identified in events reported through PA-PSRS.
- Assess strategies to decrease newborn misidentification.

SELF-ASSESSMENT QUESTIONS

The following questions about this article may be useful for internal education and assessment. You may use the following examples or develop your own questions.

1. All of the following are common reasons why newborns are misidentified *except*:
   a. Similar birth dates
   b. Same medical record number as mother
   c. Identical surname for multiple births
   d. Similar weight and length
2. Which one of the following is the most common type of event associated with newborn misidentification, as reported in Pennsylvania?
   a. Managing breast milk
   b. Administering medications
   c. Performing radiology procedures
   d. Carrying out laboratory orders
3. Which one of the following is identified as a contributory factor in newborn misidentification?
   a. Labels not readily available at the point of care
   b. Patient identification labels placed on both the wrist and ankle of the newborn
   c. Scanning barcodes before administering breast milk
   d. Using two identifiers during computerized provider-order entry
4. Adelman et al. suggest a distinct naming system using a combination of the mother's and newborn's names such as _____ .
   a. BabyboyWendy Jackson
   b. Babygirl and Wendy Jackson
   c. Wendysboy Jackson
   d. Wendysbabyboy Jackson
5. Which one of the following breast milk administration practices could contribute to newborn misidentification?
   a. Including parents in the identification process
   b. Warming breast milk in the preparation area
   c. Using a nursing double-check process
   d. Placing smudge-proof labels to ensure legibility

Question 6 refers to the following scenario:

A 31-week-old newborn was transferred to the Neonatal Intensive Care Unit for monitoring and evaluation. The nurse found a signed surgical consent for a biliary atresia in the patient's chart, but the patient was not scheduled for this procedure. She contacted the resident who obtained the consent and was told to disregard it. The nurse discovered there was another patient in the unit with a similar last name.

6. In the above scenario, which one of the following statements is most likely true?
   a. Information on the patient's identification bands was incorrect.
   b. The resident did not check two forms of identification in the patient's chart.
   c. The parents consented to the wrong procedure.
   d. The resident used the wrong consent form.

Question 7 refers to the following scenario:

A newborn is found in a mother's room without any patient identification bands. One identification band is found taped to the newborn's bassinet and the other has been placed on the counter.

7. Which one of the following interventions is most effective in preventing newborn misidentification?
   a. Make sure the identification band taped to the bed is correct.
   b. Place one of the identification bands on the newborn.
   c. Find out why the identification bands were removed and take corrective action.
   d. Remove the identification bands from the patient's room.

©2016 Pennsylvania Patient Safety Authority

Update on Medication Errors Associated with Incorrect Patient Weights

Bryan R. Bailey, PharmD, BCPS
Patient Safety Analyst
Michael J. Gaunt, PharmD
Sr. Medication Safety Analyst
Matthew Grissinger, RPh, FISMP, FASCP
Manager, Medication Safety Analysis
Pennsylvania Patient Safety Authority

ABSTRACT

Healthcare practitioners require a current, accurate patient weight because weight is often used to determine an appropriate medication dose. When errors occur during the process of obtaining, documenting, and communicating and using a patient's weight, the dose of a medication can be dangerously incorrect. Analysts reviewed event reports relating to patient weight submitted to the Pennsylvania Patient Safety Authority through the Pennsylvania Patient Safety Reporting System from December 2008 through November 2015. Of the 1,291 event reports related to patient weights, the majority of errors reached the patient (74.8%, n = 966) and the most common factors involved were documented weight too high (23.8%, n = 307), confusion between pounds and kilograms (23.2%, n = 300), and documented weight too low (14.9%, n = 192). Important risk-reduction strategies include obtaining a current, accurate weight instead of relying on a historical, stated, or estimated weight; and obtaining, documenting, and communicating patient weights in metric units only (i.e., grams or kilograms). (Pa Patient Saf Advis 2016 Jun;13[2]:50-57.)

Corresponding Author
Matthew Grissinger

INTRODUCTION

Healthcare practitioner access to key patient information is an essential element of the medication use process.[1] Key patient information used to guide appropriate medication therapy includes age, weight, height, allergies, diagnoses, laboratory values, and vital signs.[1] A 1995 study indicated that inadequate availability of patient information during medication prescribing, dispensing, and administration was associated with nearly one-fifth (18%) of identified errors.[2]

Determining the appropriate dose of many medications requires an accurate patient weight. Numerous medications are dosed on units of weight (e.g., mg/kg, mcg/kg/min). Other medications are dosed by body surface area (BSA; e.g., mg/m^2), which incorporates a patient's weight. Additionally, various medications require dosage adjustments based on renal function, using creatinine clearance (CrCl) as determined by a formula (e.g., the Cockcroft-Gault formula) that requires an accurate patient weight.[3] A missing or inaccurate patient weight can cause a prescribed medication dose to be significantly different from the appropriate dose and negatively impact patient outcome.[3-5]

A previous review of events reported to the Pennsylvania Patient Safety Authority through its Pennsylvania Patient Safety Reporting System (PA-PSRS) identified a variety of problems related to obtaining and documenting accurate patient weights.[6] A 2014 ECRI Institute report on weight-based medication dosing errors reported to the ECRI Patient Safety Organization (PSO) from September 2012 through August 2013 indicates that organizations continue to struggle with obtaining and documenting accurate patient weights.[7] It appears that medication errors related to the process of obtaining and documenting patient weight continue in spite of recommendations from multiple organizations designed to reduce errors associated with patient weight.[8-13] As such, analysis was performed on weight-related events reported to the Authority since its 2009 analysis.

METHODS

Analysts reviewing events reported to the Authority through PA-PSRS can classify reports using a monitor code for future query opportunities. Analysts searched the PA-PSRS database for reports of medication errors tagged as weight-related, and "Other" event type reports that were weight related, submitted to the Authority from December 2008 through November 2015. These queries yielded 1,167 and 154 reports, respectively, for a sum of 1,321 reports.

The medication name, patient care area, event type, event description, and harm score, adapted from the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) harm index,[14] were provided by the reporting facility. When a medication name data field was left blank or incomplete but the name was provided in the event description, an analyst adjusted the medication name field. Reports were evaluated to first verify that the event was related to patient weight and then determine what factors were associated with the event. Reports were categorized into type of error (e.g., confusion between pound [lb] and kilogram [kg], incorrect estimated weight) based on analysis of the event description. Analysts could assign multiple types of error for each report, based on the event description. Analysts identified reports involving high-alert medications, based on the *ISMP List of High-Alert Medications in Acute Care Settings*.[15] Roughly 3% (n = 30) of the reports were excluded from final analysis because they had been submitted more than once (n = 7) or the event was not related to patient weight (n = 23). Consequently, 1,291 event reports were included in the final analysis.

©2016 Pennsylvania Patient Safety Authority

RESULTS

Based on harm score, almost three-fourths (74.8%, n = 966) of events reached the patient (harm score = C through I) and 0.9% (n = 11) resulted in patient harm (harm score E through I; see Figure 1). Almost one-third (30.7%, n = 396) of events required patient monitoring or intervention to preclude harm (harm score D). A majority (8 of 11) of the events with patient harm involved high-alert medications.

Emergency departments (EDs; 29.4%, n = 379) were the most frequently involved care area. When totaled, a variety of intensive care units (ICUs) comprised 15.9% (n = 205) of care areas involved. Figure 2 shows the most commonly reported specific patient-care areas, encompassing 65% (n = 839) of events.

More than one-quarter of events involved pediatric patients (age younger than 18 years; 26.3%, n = 340) and 38% (n = 490) of events involved elderly patients (65 years of age or older). However, only 1 of the 11 harm events (9.1%) involved a pediatric patient.

Figure 3 shows the medications most commonly reported to be involved in the events. The top 10 medications were involved in 63.7% (n = 823) of event reports. Two anticoagulants, heparin (29.7%, n = 383) and enoxaparin (8.6%, n = 111), were involved in almost two-fifths (38.3%, n = 494) of events. In the entire dataset, more than half (59.3%, n = 765) of the events involved a high-alert medication. The specific medication involved could not be determined in nearly 10% (9.6%, n = 124) of reports.

When evaluating event types as reported by facilities, the five most common event types accounted for 94.4% (n = 1,219) of the events (see Table). Wrong dose/over dosage events represented the most commonly reported event type, comprising 42.2% (n = 545) of all reports.

Figure 1. Harm Scores for Events involving Incorrect Patient Weights, as reported to the Pennsylvania Patient Safety Authority, December 2008 through November 2015 (N = 1,291)

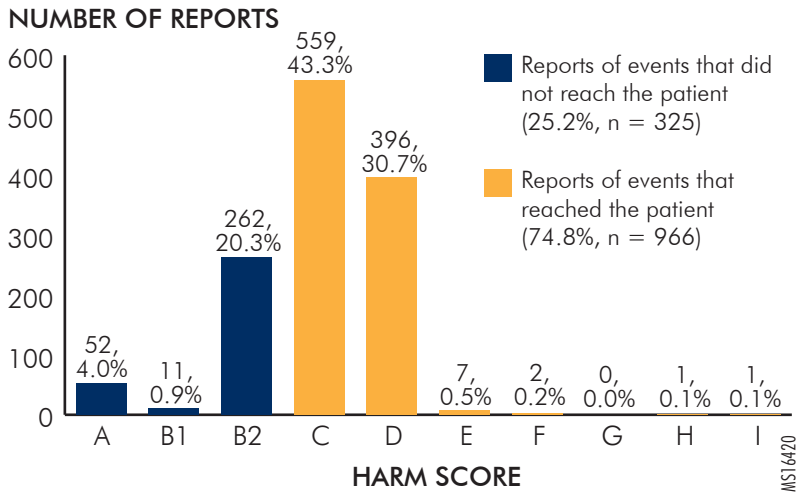
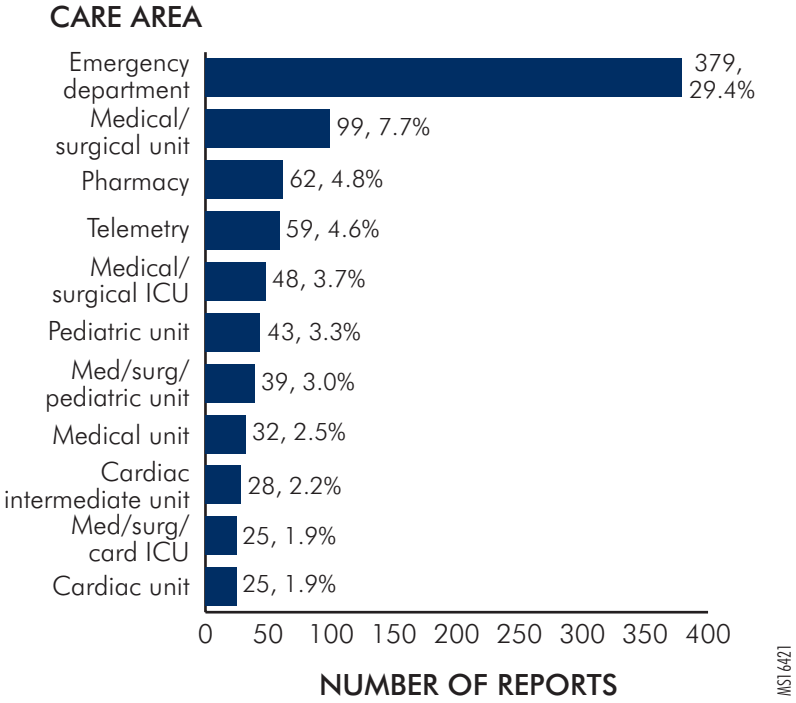
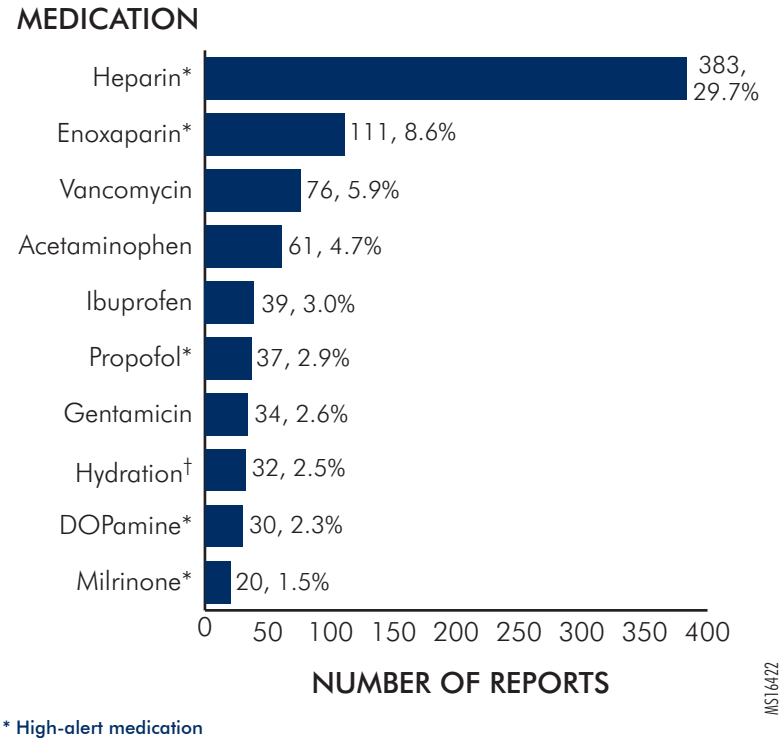


Figure 2. Care Areas Most Commonly Reported in Events Involving Incorrect Patient Weights, as reported to the Pennsylvania Patient Safety Authority, December 2008 through November 2015 (N = 1,291)



©2016 Pennsylvania Patient Safety Authority

Figure 3. Most Common Medications involved in Events related to Incorrect Patient Weights, as reported to the Pennsylvania Patient Safety Authority, December 2008 through November 2015 (N = 1,291)



* High-alert medication
† Represents intravenous replacement and maintenance fluids (e.g., lactated Ringer, normal saline, dextrose with saline solutions)

Table. Medication Error Event Types Associated with Events Involving Incorrect Patient Weights, as Reported to the Pennsylvania Patient Safety Authority, December 2008 through November 2015 (N = 1,291)

EVENT TYPE	NO. OF REPORTS	%*
Wrong dose/over dosage	545	42.2
Other	223	17.3
Wrong dose/under dosage	215	16.7
Wrong rate (intravenous)	182	14.1
Monitoring error	54	4.2
All other event types	72	5.6

* Total is greater than 100% because of rounding

Analysis revealed several factors, or types of errors, associated with medication errors involving patient weight (see Figure 4). The three most commonly identified factors, documented weight too high (23.8%, n = 307), confusion between pounds and kilograms (23.2%, n = 300), and documented weight too low (14.9%, n = 192) were found in more than 60% (n = 799) of event reports. Analysts were unable to determine a contributing factor in 18.5% (n = 239) of events.

The following are examples of events in which the documented weight was too high.*

> *A premature infant was ordered 1mEq/kg of potassium chloride as a replacement dose for a K [potassium] value of 2.5. Patient's weight is 0.58 kg. The nurse incorrectly changed the dosing weight from 0.58 to 6 kg [increasing the documented weight by a factor of 10]. Within the same minute, she realized the error and changed the weight back [to the correct value]. Pharmacy dispensed the medication (14.4 mL or 6 mEq) based on the [incorrect weight value (approximately a 10-fold error)] and the medication was administered. A double check was completed prior to administration. During the administration, the patient developed bradycardia and was successfully resuscitated. Potassium chloride administration was stopped during resuscitation. Later in the day, pharmacy discovered that the dose sent was based on a 6 kg weight that was in their EMR [electronic medical record] system.*

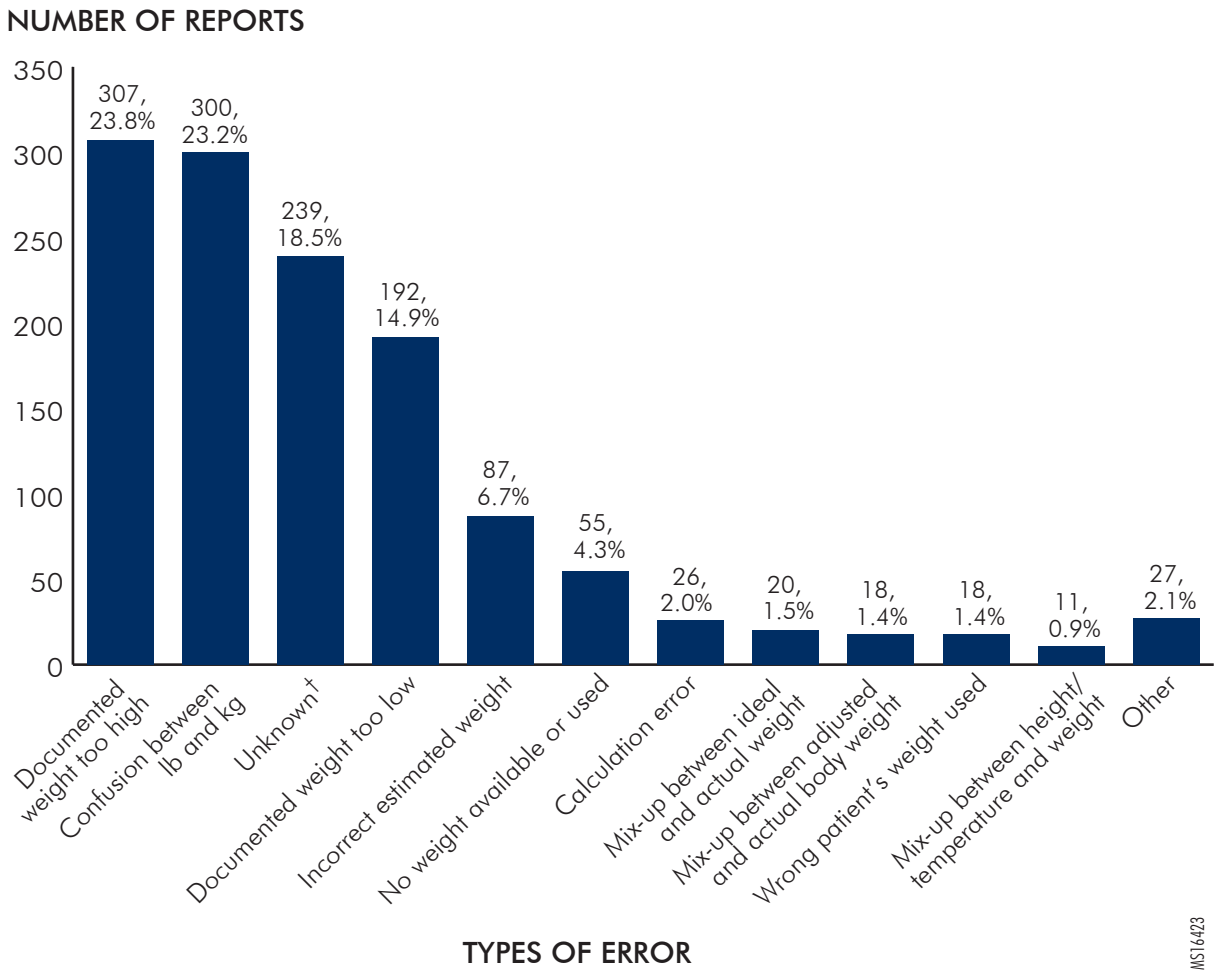
> *A patient was dosed milrinone based on an incorrect weight of 400 kg. The patient's actual weight is 114 kg. The patient subsequently developed short runs of ventricular tachycardia and hypotension. He became symptomatic with complaints of fatigue and lightheadedness. The milrinone was stopped and the patient was treated with norepinephrine and stabilized.*

> *A pediatric patient was written an order for fentaNYL 1 mcg/kg/dose.*

* The details of the PA-PSRS event narratives in this article have been modified to preserve confidentiality.

©2016 Pennsylvania Patient Safety Authority

Figure 4. Types of Error involving Incorrect Patient Weights, as identified in Reports Submitted to the Pennsylvania Patient Safety Authority, December 2008 through November 2015 (N = 1,291)*



* Analysts could classify a given report under multiple error types. Percentages are based on total number of reports.
† The report did not have enough information to determine the error type.

Patient's weight entered incorrectly in electronic health record as 67 kg. The patient weighs 5.6 kg. Dose was ordered by anesthesia as 67 mcg instead of 5.6 mcg. FentaNYL given in OR [operating room] (dose not recorded). The surgeon reported child had bronchospasms and desaturations during OR case. Pharmacy saw this order in PACU [postanesthesia care unit] and halted immediately.

The following are examples of events in which there was confusion between pounds and kilograms.

The physician placed the patient's weight into the record but placed the pounds in as kilograms (i.e., 160 pounds was input as 160 kg). Pharmacy mixed the [alteplase] dose according to the weight. The nurses verified the dose off the incorrect weight and administered the bolus of 9 mg as calculated by pharmacy and started the drip of 81 mg over 1 hour. Approximately 50 minutes into the infusion of the drip, it was noted that the weight was incorrect and the bolus was stopped. The patient was given approximately 72 mg of the drip. According to pharmacy, the patient should have been dosed with a bolus of 6.5 mg and a drip of 58.9 mg. The patient received an overdose of

©2016 Pennsylvania Patient Safety Authority

approximately 15.6 mg. The patient subsequently hemorrhaged and required intubation and chest tube insertion for hemothorax.

Patient triaged in ED via EMS [emergency medical services] following witnessed generalized seizure at home. Patient has history of seizures and has been treated with phenobarbital 30 mg PO BID [orally, twice a day] at home. Patient's weight obtained in triage and recorded in EMR as 55.7 kg, however patient's actual weight is 55.7 lb (25.3 kg). The initial PHENobarbital level was less than 2.1 [mcg/mL, normal therapeutic range: 15 to 40 mcg/mL], therefore a loading dose of 20 mg/kg was prescribed to be administered over 30 minutes. Actual dose administered was 1,100 mg but based on correct weight the dose should have been 505 mg. After the loading dose infusion, patient became lethargic and difficult to arouse and anesthesiology and neurology were consulted. A repeat phenobarbital level was over 50 [mcg/mL]. The patient was intubated, ventilated, and transferred to tertiary care facility.

The following are examples of reports in which the documented weight was too low.

The patient weighs 108 kg and was on a heparin drip with dose at 18 units/kg/hr. The IV [intravenous] pump was programmed with weight of 1.08 kg. The patient's aPTT level was subtherapeutic.

Patient's weight on acute care floor today of 39.8 kg, triple checked and compared to ED weight of 21.7 kg. The discrepancy was reported to the senior resident. Patient's mom states patient was weighed on a bed in the ED and that she (mom) commented that the weight of 21.7 kg didn't seem accurate in the ED, but the 21.7 kg was still documented. Patient's pain medications were based on home dosing regimen, but patient was also on cefTRIAXone and azithromycin and doses were adjusted for the correct weight. Patient has had negative blood cultures to date and antibiotics were increased as preventive measure.

Patient weighed 62 kg in ED. A heparin drip was initiated in ED using this weight. Patient was received to floor with heparin drip infusing. Patient was weighed via bed scale, which was zeroed out prior to use. Patient weighed at 72.2 kg (10 kg difference). Patient was receiving wrong dose because of wrong weight. The nurse weighed patient on bathroom style scale twice in ED. Both times, she obtained same weight of 62 kg and dosed heparin accordingly. Later the nurse learned of discrepancy in weight from floor nurse, so she weighed herself and found scale [ED bathroom style scale] to be off by 10 kg. The scale was placed out of service until battery changed.

Another significant factor identified in event reports was the incorrect estimation of patient weight (6.7%, n = 87; see Figure 4). Healthcare practitioners most frequently performed incorrect estimation of patient weight, but incorrect weight estimates were also provided by patients, family members, and guardians. Besides the event reports clearly associated with incorrect estimated weights, many of the events related to too high or too low documented weights were likely related to the practice of estimating weights. Fifty-four percent (n = 47 of 87) of the incorrect estimated weight events provided enough information to calculate a percent difference between estimated and actual weight. Of these 47 events, the estimated weight was wrong by more than 10% in 80.9% (n = 38 of 47) events. The percent of error ranged from 6% to 75%; in one such case, this represented a 58 kg (32.8%) underestimation of the patient's weight. Examples of these reports follow.

The admission weight entered in the chart was 63 kg, which is listed as an "estimated weight." When a heparin drip was ordered for the patient, the order automatically pulled in the admission weight. This was not the patient's actual weight. On subsequent days when the patient was actually weighed, her weight was found to be significantly lower at 58 kg. Since heparin is dosed by weight, the patient was receiving a higher dose of heparin than she required. I noticed this error after the patient's a PTT was supratherapeutic on two consecutive days. This error could have been avoided if the patient was actually weighed on admission.

An [adult patient] was admitted with nausea, vomiting, chest pain, anxiousness, and DKA [diabetic ketoacidosis] (BG [blood glucose] 484 mg/dL). In the ED, an insulin bolus of 10 units (regular) and infusion at 10 units/hr was ordered. The patient only had an estimated weight in the ED of 85 kg. An actual weight performed once patient arrived to ICU a few hours later was 66 kg. The patient's BGs dropped precipitously to 146 mg/dL and the insulin infusion was turned off. The patient needed the insulin infusion placed back on later that morning, due to an increased anion gap. The initial error in weight may have contributed to a rate that caused the precipitous [drop] that led to infusion stopped prematurely.

Examples of less frequently identified factors (see Figure 4) or multiple factors identified in one event report follow.

Received patient from ED with norepinephrine and DOBUTamine infusing through peripheral lines at too high of an hourly rate. The weight had been entered as 240 kg on the pump. When receiving report from ED, the nurse had stated the

©2016 Pennsylvania Patient Safety Authority

estimated weight of the patient was 240 lb. The patient has red tracking from peripheral IV site where DOBUTamine was infusing.

Patient's weight was accidentally entered into dose field by pharmacist. Patient received 72 units/kg/hr of heparin instead of 12 units/kg/hr, which exceeded the maximum rate. Patient received more than 5,000 units of heparin over an hour instead of the ordered 1,000 units. For unknown reasons, the pharmacist overrode a dose alert warning. The nurse attempted to use the drug library to program the pump but received an alert and programmed the pump manually. CT [computed tomography] [scan] of head showed no evidence of acute intracranial pathology.

Clinical oncology specialist noticed weight was significantly different between flow sheet and medication order. The specialist used kg weight to dose chemotherapy order and did not notice conversion was incorrect by 10 kg. The weight difference was not noticed by anyone prior to patient receiving chemotherapy. The patient received one dose of chemotherapy and was scheduled for next cycle on a later date. Upon further investigation, it was noted that weight was recorded in pounds with an incorrectly calculated kilogram weight next to it.

The patient was given acyclovir based on her real body weight. Per the infectious disease team, the acyclovir should have been prescribed based on the patient's ideal body weight. The patient developed renal failure as a result of the incorrect doses.

A heparin drip was ordered at 18 units/kg/hour. [Pharmacy] dosing weight was 82 kg which = 1,476 units/hr = 14.8 mL/hr. Patient's actual weight was 68 kg =1,224 units/hr = 12.2 mL/hr. Shortly after the order was verified, the nurse called the pharmacy with a new weight. The pharmacist updated the weight that populates into [the pharmacy information system] with the patient's new and accurate weight. The new weights in [electronic health record] do not populate to [pharmacy information system], thus any dosing based on weight may be incorrect.

DISCUSSION

Similar to the previously published *Advisory* article[6] and ECRI Institute report,[7] data analysis revealed general themes related to errors involving patient weight. These themes revolve around (1) obtaining a current, accurate patient weight; (2) documenting and communicating the weight value; and (3) properly using the weight value. Event reports exposed the complexity and error-prone nature of obtaining, documenting, communicating, and using patient weights.

Numerous difficulties in obtaining a current, accurate patient weight exist.[6] For example, many critically ill patients are not weighed in EDs and ICUs because of the urgency of their clinical status.[5,16,17] Healthcare facilities may not possess the equipment necessary (e.g., standing scales, pediatric scales, wheelchairs scales, bed scales) to facilitate the accurate collection of patient weights.[16,17] Even if present, the equipment may not be functional or reliable.[18] These barriers may lead clinicians to forego weighing a patient and decide to use a previously documented weight or estimate a patient's weight.[5,16,17,19] Abundant literature exists highlighting the inaccuracies of clinicians and patients/caregivers estimating patient weights and its association with medication errors, adverse events, and clinical ineffectiveness.[5,6,11,16] Our analysis revealed ample evidence that Pennsylvania healthcare practitioners experience and encounter many of these same barriers to obtaining a current, accurate patient weight.

Once clinicians overcome the barriers associated with obtaining a current, accurate patient weight, they face obstacles related to documenting and communicating the weight to other members of the healthcare team. Clinicians must take the obtained weight value and accurately transfer this information to the medical record, either paper based or electronic, and to an infusion pump or other systems requiring this information. This is a process ripe for error as demonstrated by many events (23.2%, n = 300) involving confusion between pounds and kilograms. A clinician may obtain a weight measured in pounds and forget to convert to kilograms, or obtain a weight in kilograms but document it incorrectly as pounds. Additionally, clinicians may transcribe the weight into the medical record or infusion pump incorrectly, by transposing numbers or using the wrong patient's weight.

Similar to the issue described by Hilmer and colleagues,[3] certain event reports pointed to problems related to the patient weight being documented in multiple locations within the medical record. This may lead to the documentation of multiple different values in the medical record, causing confusion among clinicians about which value is current and correct. Also, depending on the location in the record where the weight is documented, some clinicians (e.g., pharmacists) may not be able access or view the weight value. This problem is exacerbated by the numerous clinical systems into which a weight should or must be documented. For example, patient weight may be required in the medical record, computerized prescriber order entry (CPOE) system, pharmacy information system, infusion pump, and other systems as appropriate. These systems may not be integrated or automatically share patient weight information, resulting in the possibility of multiple different weight values being documented across systems.

Although many medications dosed by weight use a patient's actual weight, in some situations it is more appropriate to

©2016 Pennsylvania Patient Safety Authority

use a patient's ideal body weight (IBW), adjusted body weight (ABW), or another determined weight value to serve as the "dosing weight."[20,21] Patients can receive inappropriate dosages of medications when the actual body weight is used as the dosing weight instead of the more appropriate IBW or ABW, or vice versa. In nearly 3% (n = 38) of event reports, these mix-ups were identified as a factor contributing to the event.

Perhaps more significant is the risk of perpetuating the use of an inaccurately obtained or documented patient weight throughout the episode of care.[19,22,23] Fuller and colleagues found that nearly 80% of patients given vancomycin (a medication that should be dosed by weight) in the ED and subsequently admitted to the hospital received an unchanged, inappropriate dose.[19] Although the benefits of electronic health records (EHRs) are numerous, Bokser describes the dangers associated with EHRs and the perpetuation of bad data and subsequent erroneous decision support.[22]

Limitations

In-depth analysis by the Authority of medication errors involving patient weight occurring in Pennsylvania facilities is limited by the information reported through PA-PSRS, including the error description and reasons why the event occurred. Additional patient weight events and associated causes may have been reported but not identified by the query and analysis. Additionally, unique organizational reporting cultures and patterns, along with different interpretations of what occurrences are reportable may lead to reporting variations.

RISK REDUCTION STRATEGIES

The events included in this analysis, observations from the Institute for Safe Medication Practices, and recommendations in the literature offer strategies that healthcare facilities may consider to reduce risk of errors in the medication-use process involving patient weight. Strategies related to patient weight that healthcare facilities can apply to the medication-use process include the following:

- Ensure all patient care areas have the necessary equipment to easily obtain an accurate patient weight, including weights for infants and children, as appropriate. Examples of possible equipment include floor scales, stretchers and beds with built-in scales, and standing, chair, and wheelchair scales.[4,6-9,12,22,23]
- To facilitate accurate weight measurements, use and maintain (e.g., test, calibrate) scales in accordance with applicable manufacturer recommendations.[18,24]
- Weigh each patient as soon as possible on admission and during each outpatient or ED encounter, excluding encounters in which medications are not prescribed (e.g., laboratory visit). Avoid the use of an estimated, historical, or stated weight.[6,7,10-13]
- Measure patient weight in metric units only (i.e., grams or kilograms). Use scales that measure in metric units only, or lock scales to measure only in metric units.[7-10,12,13,22,23]
- Document and communicate patient weight in metric units only. Ensure computer information system screens, infusion pumps, and other medication device screens, printouts, and preprinted order forms prompt users to record patient weight in metric units only.[7,10,12,13,22,23]
- Develop organizational expectations that obtaining the patient's actual weight is part of the mandatory nursing assessment and reweighing of the patient occurs as warranted, based on patient's clinical condition. Consider requiring reassessment of a patient's weight when initiating or changing the dose of weight-based medications, clinical situations in which weight fluctuations are expected, or situations in which a weight variation may impact the course of care.[6,12,23,24]
- Document patient weight in a prominent location within the medical record readily viewable by all healthcare practitioners.[8,9,12]
- Develop organizational medication-use policies that state weight-based medications will not be prescribed, dispensed, or administered unless an accurate weight is available (except in emergencies).[6]
- Implement "hard stops" or automated clinical decision support at the time of data entry to alert clinicians when the weight parameter is missing (for weight-based medications) or when the entered patient weight value is not consistent with an expected value.[6,7,22,23]
- Develop organizational policies that clearly define specific criteria for when medications will be dosed by other than actual body weight (e.g., IBW, ABW) and delineate where and how this "dosing weight" will be communicated to clinicians to prevent confusion and error.[17]
- Maximize available device integration to enable automatic, accurate, and transparent transmission of patient weight data directly from scales to EHRs, pharmacy information systems, and medical devices.[22]

CONCLUSION

Healthcare practitioners need current, accurate patient information, including patient weight, to properly guide medication therapy. Analysis of 1,291 reports submitted to the Authority from December 2008 through November 2015 revealed multiple factors contributing to medication errors related to obtaining, documenting, communicating, and using patient weight. Results were consistent with those presented in 2009,[6] indicating

©2016 Pennsylvania Patient Safety Authority

that Pennsylvania facilities continue to struggle with the complexity of the issue. Risk-reduction strategies presented in this analysis may help organizations minimize the occurrence of medication errors involving patient weight.

NOTES

1. Cohen MR. Causes of medication errors. Chapter 4. In: Cohen MR, ed. *Medication errors.* 2nd ed. Washington (DC): American Pharmacists Association; 2007:56.
2. Leape LL, Bates DW, Cullen DJ, et al. Systems analysis of adverse drug events. *JAMA* 1995 Jul 5;274(1):35-43.
3. Hilmer SN, Rangiah C, Bajorek BV, et al. Failure to weigh patients in hospital: a medication safety risk. *Intern Med J* 2007 Sep;37(9):647-50.
4. Greene S, Dargan P, Shin GY, et al. Doctors and nurses estimation of the weight of patients: a preventable source of systematic error. *J Toxicol Clin Toxicol* 2004;42(5):611-15.
5. Barrow T, Khan M, Halse O, et al. Estimating weight of patients with acute stroke when dosing for thrombolysis. *Stroke* 2016 Jan;47(1);228-31.
6. Pennsylvania Patient Safety Authority. Medication errors: significance of accurate patient weights: Pa Patient Saf Advis 2009 Mar [cited 2016 Jan 12]. http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2009/Mar6(1)/Pages/10.aspx
7. ECRI Institute. Medication safety: inaccurate patient weight can cause dosing errors [online]. 2014 Feb [cited 2016 Jan 15]. https://www.ecri.org/components/PSOCore/Pages/PSONav0214.aspx?tab=1
8. Emergency Nurses Association. Position statement: weighing pediatric patients in kilograms [online]. 2012 Mar [cited 2016 Jan 5]. https://www.ena.org/practice-research/Practice/Position/Pages/WeighingPedsPtsInKilo.aspx
9. American Academy of Pediatrics. Joint policy statement—guidelines for care of children in the emergency department. *Pediatrics* 2009 Oct;124(4):1233-43.
10. The Joint Commission. Preventing pediatric medication errors [online]. Sentinel Event Alert 2008 Apr 11 [cited 2016 Jan 12]. http://www.jointcommission.org/sentinel_event_alert_issue_39_preventing_pediatric_medication_errors/
11. Michaels AD, Spinler SA, Leeper B, et al. Medication errors in acute cardiovascular and stroke patients: a scientific statement from the American Heart Association. *Circulation* 2010 Apr;121(14):1664-82.
12. Emergency Nurses Association. Position statement: weighing patients in kilograms [online]. 2012 Mar [cited 2016 Jan 13]. https://www.ena.org/practice-research/Practice/Position/Pages/Weighing-PtsinKG.aspx
13. Institute for Safe Medication Practices. 2016-2017 targeted medication safety best practices for hospitals [online]. 2015 Dec [cited 2016 Jan 15]. http://www.ismp.org/tools/bestpractices/TMSBP-for-Hospitals.pdf
14. National Coordinating Council for Medication Error Reporting and Prevention. NCC MERP index for categorizing medication errors [online]. 2001 Feb [cited 2016 Jan 11]. http://www.nccmerp.org/types-medication-errors
15. Institute for Safe Medication Practices. ISMP list of high-alert medications in acute care settings [online]. 2014 [cited 2016 Jan 11]. http://www.ismp.org/Tools/institutionalhighAlert.asp
16. Lin BW, Yoshida D, Quinn J, et al. A better way to estimate adult patients' weights. *Am J Emerg Med* 2009 Nov;27(9):1060-64.
17. Herout PM, Erstad BL. Medication errors involving continuously infused medications in a surgical intensive care unit. *Crit Care Med* 2004 Feb;32(2):428-32.
18. Byrd J, Langford A, Paden SJ, et al. Scale consistency study: how accurate are inpatient hospital scales? *Nursing* 2011 Nov;41(11):21-24.
19. Fuller BM, Mohr N, Skrupky L, et al. Emergency department vancomycin use: dosing practices and associated outcomes. *J Emerg Med* 2013 May;44(5):910-18.
20. Ginzburg R, Barr WB, Harris M, et al. Effect of a weight-based prescribing method within an electronic health record on prescribing errors. *Am J Health-Syst Pharm* 2009 Nov 15;66(22):2037-41.
21. Pai MP. Drug dosing based on weight and body surface area: mathematical assumptions and limitations in obese adults. *Pharmacotherapy* 2012 Sep;32(9):856-68.
22. Bokser SJ. A weighty mistake [online]. WebM&M 2013 Mar [cited 2016 Jan 11]. https://psnet.ahrq.gov/webmm/case/293
23. Paparella, S. Weighing in on medication safety. *J Emerg Nurs* 2009 Nov;35(6):553-55.
24. Tipton PH, Aigner MJ, Finto D, et al. Consider the accuracy of height and weight measurements. *Nursing* 2012 May;42(5):50-52.

©2016 Pennsylvania Patient Safety Authority

Health Literacy and Patient Safety Events

Lea Anne Gardner, PhD, RN
Senior Patient Safety Analyst
Pennsylvania Patient Safety Authority

ABSTRACT

Structuring and presenting healthcare information that aligns with a patient's level of understanding can help patients achieve optimal outcomes. The Pennsylvania Patient Safety Authority is participating in a statewide health literacy initiative focused on providing strategies to healthcare providers that help patients understand and engage in their medical care. A search of the Pennsylvania Patient Safety Reporting System identified 265 potential health literacy–related event reports in which patients misunderstood or did not comprehend healthcare instructions provided to them by healthcare clinicians. The most frequent outcomes of patients misunderstanding instructions or information were delayed or cancelled procedures, surgeries, treatments, or tests; or patients leaving without being seen. Verbal communication strategies such as "teach back" and "Ask Me 3®" programs and written strategies address opportunities identified in the event reports and may help improve patient understanding and engagement in their care. (Pa Patient Saf Advis 2016 Jun;13[2]:58-65.)

Scan this code with your mobile device's QR reader to access the Authority's toolkit on this topic.

INTRODUCTION

Helping patients understand healthcare information and instructions is pivotal to engaging patients to improve their own health and safety. The challenge in communicating complicated and sometimes evolving healthcare information is in the presenter's ability to deliver the information in a clear yet concise manner. Learning to read and speak healthcare terminology is akin to learning a foreign language. Acronyms, abbreviations, and Latin-based words are often used to represent complex concepts. Individuals unfamiliar with medical terms frequently struggle to understand and make decisions based on information presented to them. Analysts from the Pennsylvania Patient Safety Authority identified event reports in which the patient's misunderstanding of healthcare instructions or information adversely impacted the patient's care.

Communication gaps are not new to healthcare and can contribute to Serious Events, including permanent loss of function and even death.[1] Health literacy, the ability to comprehend healthcare information, goes beyond reading and writing, and includes listening, speaking, and numeracy (i.e., use of math skills and reasoning for decision-making in everyday situations) in order to make informed healthcare choices.[2]

In 2010, the Health Care Improvement Foundation and Thomas Jefferson University and Hospitals started a health literacy initiative funded by the Pennsylvania Department of Health. This program, Southeastern Pennsylvania Regional Enhancements Addressing Disconnects in Cardiovascular Health Communication (SEPA-READS), began as a regional effort in Southeastern Pennsylvania and initially focused on older adults, age 50 or older, with cardiovascular disease. The SEPA-READS program has since expanded across the Commonwealth and helped spur the formation of the Pennsylvania Health Literacy Coalition.[3] In December 2015, Authority staff attended a train-the-trainer program, "Communicating to Connect: Strategies to Improve Health Literacy." This program taught Authority staff about health literacy principles and provided methods to disseminate this information among Pennsylvania healthcare facilities to improve patient comprehension of healthcare information. To better understand the impact of health literacy on patient care in Pennsylvania, Authority analysts searched the Pennsylvania Patient Safety Reporting System (PA-PSRS) database to identify potential health literacy–related event reports.

METHODS

Analysts queried the PA-PSRS database, searching the event narratives and recommendation data fields using the following keywords and phrases: "misunderstood," "misunderstand," "comprehend," "did not understand," and "did not follow directions;" the query was for the 10-year time period of January 2005 through December 2014. Analysts read event report narratives to identify potential health literacy–related event reports (i.e., situations in which patients either misunderstood or did not comprehend healthcare instructions or information provided to them by healthcare clinicians). Situations in which healthcare workers misunderstood instructions or orders were excluded.

Potential health literacy–related event reports were analyzed according to patient age and harm score.*

Event report narratives and PA-PSRS data fields labeled "contributing factors" (e.g., patient not understanding) and "remedy factors" (i.e., what was done to remedy the

* The Pennsylvania Patient Safety Authority Harm Score Taxonomy is available online at http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2015/mar;12(1)/PublishingImages/taxonomy.pdf.

©2016 Pennsylvania Patient Safety Authority

situation) were further analyzed to identify patient outcomes, event explanations (e.g., preoperative instructions not followed), contributing factors, and remedies.

Event reports describing patients with cognitive impairment were also found and analyzed separately to identify outcomes specific to this subgroup.

RESULTS

Patient-Related Event Reports

Analysts identified 265 potential health literacy-related event reports in which patients misunderstood or failed to understand instructions or information provided by healthcare clinicians.

Patient age. The largest number of event reports (16.6%, n = 44 of 265) involved patients 51 to 60 years old. See Figure 1 for the age distribution from newborns to 94 years.

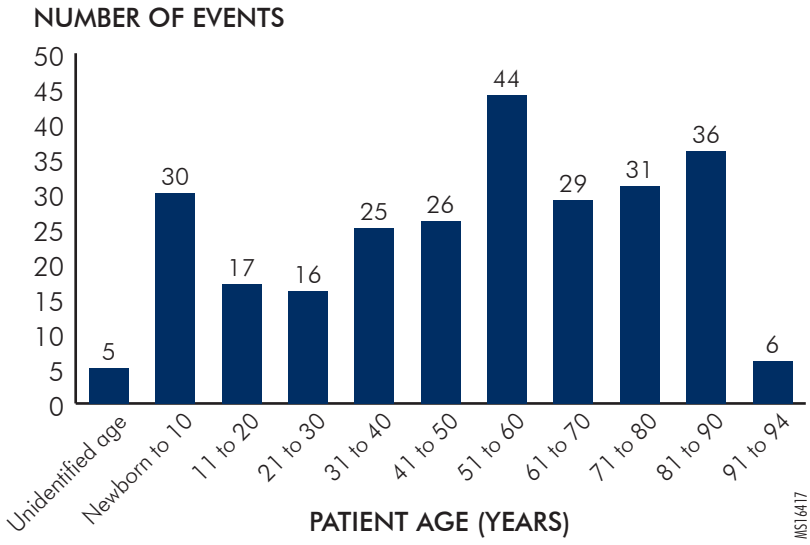
Harm score. Ten (3.8%) events were reported as Serious Events; harm scores were E and F. There were no event reports with the harm scores G, H, or I. The majority of events (48.3%, n = 128 of 265) were reported as a harm score C followed by the next harm score category D (27.9%, n = 74).

Outcomes, explanations, contributing factors, and remedies. Seven outcomes, five explanations, four patient-related contributing factors, and one patient-related remedy were identified (Table 1). Outcomes were identified in all but one report. The most frequently reported outcome was a delayed or cancelled procedure/surgery/treatment/test or the patient leaving without being seen (33.7%, n = 89 of 265), followed by patient falls (30.7%, n = 81). Fewer than half of the event reports identified an explanation (35.8%, n = 95 of 265), contributing factor (29.0%, n =77), or remedy (26.8%, n = 71).* Patients not following preoperative instructions (54.6%, n = 53 of 97) was the most frequently reported explanation for a misunderstanding. The most frequently reported contributing factor was patient not understanding (80.5%, n = 62 of 77); lack of patient compliance, the second most frequently reported contributing factor, often results from lack of patient understanding.[4] Talking to the patient/family was the only patient-related remedy identified (n = 71).

Cognitive impairment. A subgroup of 75 event reports (28.3%) was identified that described patients who were confused, had cognitive disorders (e.g., Alzheimer's disease, dementia), psychiatric disorders, or an inability to comprehend instructions (e.g., traumatic brain injuries). Patients in this subgroup experienced the outcomes shown in Table 2.

* Several event reports identified more than one explanation or contributing factor for patients not following a healthcare worker's directions.

Figure 1. Potential Health Literacy–Related Events Involving Patient Misunderstanding as reported through Pennsylvania Patient Safety Reporting System, By Patient Age (Years), 2005 through 2014 (N = 265)



Examples of Patient Misunderstandings

The following are de-identified PA-PSRS event narratives.†

Delayed or Cancelled Procedure/Surgery/Treatment/Test

> *Even though the patient had pre-op instructions explained to her yesterday, she obviously did not understand. The nurse explained the instructions several times and the patient's husband said he could stay and would be able to take a taxi home with his wife, the patient. This [action] did not transpire and the patient's procedure had to be cancelled on the day of surgery.*

> *Patient was to have an outpatient MRI with sedation. The patient had concerns about sedation. Investigation with involved staff revealed that detailed explanations were given to the patient. The patient was extremely anxious about the*

† The details of the PA-PSRS event narratives in this article have been modified to preserve confidentiality.

©2016 Pennsylvania Patient Safety Authority

procedure. The patient left without sedation or the test being performed.

Falls

The patient had been to the bathroom without assistance. The patient at times did not understand what was being said. Just prior to being admitted to the floor, and after family had left, the patient staggered out of the room and fell in the hallway. No injury noted. The patient was immediately raised up to his feet and assisted back into his room.

Patient stated several times that she wanted to get into bed. She was told that her physician ordered her to sit in a chair. The patient did not understand what was told to her. Patient was found by staff in the bathroom.

Patient has right hemiparesis. Patient was instructed not to get up without assist. Patient dropped her glasses on the floor, and in an attempt to get them, she fell.

Table 1. Potential Health Literacy-Related Event Outcomes, Explanations, Contributing Factors, and Remedies, as Reported through Pennsylvania Patient Safety Reporting System, January 2005 through December 2014 (N = 265)

OUTCOMES	NO. OF EVENT REPORTS	% OF EVENT REPORTS
Delayed or cancelled procedure/surgery/treatment/test or patient left before being seen	89	33.7
Fall	81	30.7
Medication error	31	11.7
Premature removal of pulmonary, gastric, or peripheral central catheters	19	7.2
Aggression by patient or family	11	4.2
Wrong procedure/site	4	1.5
Miscellaneous (e.g., skin tears, patients leaving unit, removed dressing)	29	11.0
Total	**264***	**100**
EXPLANATIONS†		
Preoperative instructions not followed	53	55.8
Language barrier	15	15.8
Discharge instructions not followed	13	13.7
Consent issue	9	9.5
Change in mental/medical status	8	8.4
Total	**95§**	**100**
CONTRIBUTING FACTORS†		
Lack of patient understanding	62	80.5
Lack of patient compliance‡	37	48.1
Lack of family cooperation	7	9.1
Language barrier	4	5.2
Total	**77§**	**100**
REMEDIES		
Information or explanation provided to patient or family	71	100
Total	**71**	**100**

* One event report did not identify an outcome.

† Explanations and contributing factors not reported on all reports.

‡ Lack of patient compliance is often a result of lack of patient understanding.[4]

§ More than one explanation or contributing factor was described in some reports.

©2016 Pennsylvania Patient Safety Authority

Table 2. Cognitive Impairment-Related Outcomes, as reported through the Pennsylvania Patient Safety Reporting System, January 2005 through December 2014 (n = 264*)

OUTCOMES	EVENT REPORTS SPECIFYING COGNITIVE IMPAIRMENT (NO. OF EVENT REPORTS/TOTAL NO. OF EVENTS)
Aggression-related incidents by patients or family	81.8% (9 of 11)
Unplanned removal of tracheostomy, nasogastric, and gastric tubes	73.7% (14 of 19)
Falls	44.4% (36 of 81)
Miscellaneous issues (e.g., pressure ulcers)	20.7% (6 of 29)
Delays or cancellations in procedures, surgery, treatments, or tests	9.0% (8 of 89)
Medication errors	6.5% (2 of 31)
Wrong procedure or site	0% (0 of 4)

* One event report did not identify an outcome.

Preoperative Instructions Not Followed

The patient told the doctor that he had taken his [medication] for the past 3 days. The prescription was written for postoperative use. The patient misunderstood. The doctor explained to the patient the risk of continuing with the surgery due to the fact that he had been taking the [medication]. The patient and surgeon agreed to cancel the surgery and surgery will be rescheduled. The patient was re-educated to not take any medication prior to surgery.

The patient arrived for endoscopy. The patient misunderstood instructions and ate a sandwich two hours prior to arriving for the procedure.

The patient had a snack at 5:45 am. The parent misunderstood the NPO [nothing by mouth] instruction to stop solid food at midnight. The surgery was delayed.

Consent Issues

Consent form for trigger finger release was blank on front page. [Staff] filled in trigger finger release for patient to read but was unable to obtain permission. Patient not sure of procedure to be done, did not understand physician explanations... will have to wait until tomorrow.

Extubations

Patient found pulling her [nasogastric] tube out. Patient repositioned and order received to replace tube. Patient unable to comprehend the need to leave the tubes alone.

Patient was sitting up in the chair. When family entered the room, they noted the [patient's] Foley catheter was completely removed. The patient was in no distress... Patient in wrist restraints due to mentally...unable to comprehend reason for tubes.

DISCUSSION

In the PA-PSRS events, oral communication issues, such as misunderstanding oral instructions for preventing falls or preoperative instructions, and written communication issues, such as obtaining a consent for procedures or surgery, are challenges faced by patients and healthcare staff. A person's level of health literacy is based on word recognition, reading comprehension, and numeracy.[2] Some aspects of health literacy are not easily measured, such as oral and written communication skills, reading ability, and familiarity with language, as well as background knowledge, such as biology, and different cultural approaches to health care.[5]

Almost one third (28.3%, n = 75 of 265) of reported events in Pennsylvania involved patients with a cognitive impairment, and more than half (55.3%, n = 146 of 264) were patients age 51 or older. Many factors influence a person's ability to process and understand health care information. Individual factors may include culture, language, emotion, age, medications, previous exposure to the health care system, cognitive impairment, and general literacy, as well as acute stresses such as fatigue and illness.[2,5,6,7] Healthcare system factors include the complex and often-contradictory nature of health care information, complicated technology, diverse manners of presentation (e.g., signs, directions,) and time constraints.[5] Although certain groups of patients (e.g., older adults, non-native English speaking people) are at greater risk of having a lower level of health literacy, it is difficult to determine a person's level of health literacy by observation of how they look or speak.[5,8]

©2016 Pennsylvania Patient Safety Authority

The 2003 National Assessment of Adult Literacy (NAAL) categorized health literacy into four levels based on standardized test scores. The NAAL health literacy results showed that 12% of adults had proficient health literacy, 53% of adults had an intermediate health literacy level, 22% of adults had a basic health literacy level, and 14% had a below basic health literacy level.[9] See "Health Literacy Level Descriptions" for further information. The NAAL has been replaced by the Program for the International Assessment of Adult Competencies (PIAAC). The PIAAC was last administered in 2012 and yielded results similar to the NAAL, indicating that health literacy is relatively static at the population level.[10]

The NAAL assessed patient age, gender, race and ethnicity, language spoken before starting school, highest level of education, and poverty level. The results showed that, in general, women have a slightly higher level of health literacy than men; more adults age 65 or older had lower levels of health literacy than adults in any of the younger age groups; Hispanic adults had lower average health literacy than adults in any other race or ethnic group; adults who did not speak English before starting school had the lowest average health literacy level; and adults below the poverty level had lower average health literacy than adults living above the poverty threshold.[9]

HEALTH LITERACY LEVEL DESCRIPTIONS

Below Basic—indicates no more than the most simple and concrete literacy skills, such as not being literate in English or not locating easily identifiable information in simple documents (e.g., charts or forms).

Basic—indicates skills necessary to perform simple and everyday literacy activities, such as reading and understanding information in simple documents.

Intermediate—indicates skills necessary to perform moderately challenging literacy activities, such as locating information in dense, complex documents and making simple inferences about the information.

Proficient—indicates skills necessary to perform more complex and challenging literacy activities such as integrating, synthesizing, and analyzing multiple pieces of information located in complex documents.

Source: Kutner M, Greenberg E, Jin Y, Paulsen C. The health literacy of America's adults: results from the 2003 National Assessment of Adult Literacy (NCES 2006–483) [online]. 2006 [cited 2016 Feb 26] Washington, DC: U.S. Department of Education, National Center for Education; p. 5. http://nces.ed.gov/pubs2006/2006483.pdf

Effects of Low Levels of Health Literacy

Inadequate health literacy has been associated with poorer health outcomes.[11-14] Implementing plain language descriptions (e.g., replacing medical or technical terms with words that people use in everyday conversations) during clinical encounters and in healthcare documents can help patients understand the complex language used in healthcare.[8,15,16] A plain language agenda has been developed by the Centers for Disease Control and Prevention and the federal government; however, application of plain language into everyday documents, such as consent forms, and educational programs requires time to develop, test, and implement.[16-18] Obtaining informed consent involves more than obtaining a patient's signature on a written consent form. It is an interactive process between a patient and physician that has two major elements: a patient's awareness and understanding of a healthcare situation and treatment options, and their voluntary choice to act upon this information.[19] A patient's signature on a consent form does not necessarily confirm that the patient understands the type of treatment he or she has authorized. Studies have shown that up to half of patients did not correctly recall the risks of surgery and one third did not correctly recall the alternatives to the procedures after providing informed consent.[20-23]

Determining Health Literacy

Before implementing any health literacy strategies with patients, the first step is to ensure that the universal health literacy precautions are in place.[24] Then staff can proceed to identify whether a patient has a medical or mental health condition that will impinge on the patient's ability to understand instructions. Next, determine whether patients with limited decision-making capacity are incapable of making their own decisions (e.g., giving informed consent) or whether there are periods when they are lucid and able to actively participate in their care.[25,26] A patient's overall decision-making capacity will drive the type of risk-reduction strategies selected by healthcare staff. The following risk-reduction strategies are useful to institute in patients who are unable to comprehend instructions due to medical or mental health conditions.[7,25-31]

Risk Reduction Strategies for Patients with Impaired Decision-Making Capabilities

The following strategies can be used with patients who have impaired decision-making capability:

- Screen patients for cognitive impairment
- Engage family members or surrogate decision-makers in the patient's care
- Incorporate shared decision-making with other healthcare professionals who have cared for the patient

©2016 Pennsylvania Patient Safety Authority

Recognizing Low Levels of Health Literacy

Testing patients to determine their level of health literacy can lead to shame and alienation.[11,32-34] The literature suggests close observation and asking certain types of questions that can help identify individuals with limited reading and comprehension skills.[35] Patients with low health literacy may exhibit the following behaviors:[8,35,36]

- Make excuses when asked to read or fill out forms, such as "I don't have my glasses" or "I'll read this when I get home"
- Lift text close to their eyes, point to the text with a finger while reading, or visually wander over the page without finding a central focus
- Provide incomplete medical history or check items as "no" to avoid follow-up questions
- Listen carefully and take instructions literally to avoid mistakes
- Identify medications based on color, size, and shape
- Fail to comply with medication regimens
- Frequently miss appointments
- Show signs of nervousness, confusion, frustration, and even indifference
- Avoid situations or withdraw when complex learning is required
- Give incorrect answers when questioned about what they have read

Keep in mind that if patients do not exhibit any of these behaviors, it is not confirmation that they are health literate.[5,8]

Addressing Health Literacy

The majority of PA-PSRS events involved patients with the capacity to make healthcare decisions. Yet these patients were faced with challenges in understanding oral and or written communication instructions and are the focus of the risk-reductions strategies. Oral communication methods and programs such as the "teach back" method and the National Patient Safety Foundation (NPSF) Ask Me 3® program can provide feedback to healthcare clinicians about the patient's level of understanding.[37,38] Written communication strategies are divided according to common themes used to create the forms or instructions intended to inform patients.

Risk Reduction Strategies

Oral Communication

The following risk reduction strategies can be implemented when communicating verbally with a patient:

Verbal Communication Techniques

- Use teach back (or show me) method, which allows providers to confirm understanding by asking the patient to demonstrate or explain, in their own words, what they need to do.[6,8,15,35-37]
- Encourage patients and families to ask questions and engage in their care. NPSF's Ask Me 3® program is an example of a patient education campaign that focuses on asking questions, as follows: (1) What is my main problem? (2) What do I need to do? and (3) Why is it important for me to do this?[8,15,35,38]
- Ask patients open-ended questions instead of questions that can be answered with a yes or no (e.g., "What questions do you have? instead of "Do you have any questions?" or "Do you understand?")[15,35]

Verbal Communication Skills

- Talk slowly, use plain language.[8,15-18,24,35-37,39]
- Avoid medical jargon.[8,15,18,24,35,37,39]
- Use a trained medical interpreter for patients who have limited English proficiency.[6,24,36]
- Use videos, interactive computer programs, or pictures to accommodate different learning styles.[8,24,35,36,40]
- Keep number of points to three or less to focus on what the person needs to know and needs to do (i.e., action oriented).[8,15,24,35,39]
- Communicate as if talking to a friend to show genuine interest.[8,16,37]

Non-Verbal Communication Skills

- Face the patient when talking with him or her, make direct eye contact, and use relaxed body language.[15,24,35,37,39]

Written Communication

Written communication approaches can focus on principles that simplify written instructions and forms that include:

Document Suitability

- Use assessment tools to evaluate the overall suitability of materials, such as the Plain Language Grade level, Relevance, Interest, and Design (Plain Language GRID), Suitability of Assessment Materials (SAM), Patient Education Materials Assessment Tool (PEMAT), and the Clear Communication Index (CCI).[15,16,24,39-42]
- Explain the purpose of documents and keep the description simple (e.g., one to two key objectives).[8,35,40]
- Provide clear messages; give the most important information first, describe what actions to take, and explain their importance.[35]
- Emphasize desired behaviors.[35,40]
- Highlight the positive message.[35]
- Pretest materials for the intended audience.[8,16,40,43]

Document Content

- Write at a grade 4 to 6 level; use readability calculators such as the Simple Measure of Gobbledygook (SMOG), Fry Graph Readability Formula, and Flesch-Kincaid readability tests (which is available in Microsoft Word).[6,8,15,35,40,44,45]
- Write in short, brief sentences (no more than 10 to 15 words).[8,18,40]
- Limit paragraphs to three to five sentences.[8,16,18]

©2016 Pennsylvania Patient Safety Authority

- Use the word "must" to indicate requirements.[6,18]
- Use active voice.[8,16,18,24,40]
- Use plain language and words with one or two syllables.[8,15,18,35,36,39,40]
- Avoid medical jargon, technical, or scientific language, and unnecessary abbreviations and acronyms; if a complex term cannot be avoided, clearly define what it means.[6,8,15,16,18,35,39]
- Use audience-appropriate images and diagrams to highlight key messages.[18,35]

Document Format

- Keep design simple, with sharp contrast between text color and background paper color.[46]
- Include ample white space, use appropriate space between lines of text (e.g., 1.2 to 1.5 spacing, and leave at least ½ inch to 1 inch of white space around the margins and between columns).[8,16,18,40,46]
- Leave right margin ragged so readers can easily track their location within the text.[16,18,40,46]
- Create short lists (i.e., three to seven items) with bullets, not commas.[16]
- Use no smaller than 12 point font, ideally 14 point font; avoid italics.[8,15-18,35,40,46]
- Use a simple, clear font style; a sans serif font is generally recommended for viewing on screens and devices.[16,40]

LIMITATIONS

This retrospective review of reported events is limited by the information reported through PA-PSRS, including the event descriptions and explanations. PA-PSRS does not have structured data fields that identify health literacy events; and the search terms used may not have encompassed all of the relevant descriptions used in reported events. It is also possible that limited health literacy may have contributed to events in ways that were not recognized by staff.

CONCLUSION

Limited healthcare literacy can contribute to delays or errors in treatment that can lead to poor healthcare outcomes. The complexity of healthcare information that healthcare clinicians use every day can be overwhelming for patients to comprehend and assimilate. Clear communication of healthcare information between healthcare clinicians and patients can improve patient understanding of the benefits and risks and improve adherence with medical interventions, thereby increasing the chance of better healthcare outcomes. Achieving effective patient communication requires implementation of universal precautions in a manner that meets the health literacy needs of all patients. The written and verbal strategies identified in this article provide some initial steps that can help bridge communication gaps between clinicians and patients and lead to better informed patients.

NOTES

1. Joint Commission 2015 Sentinel Event Data: root causes by event type 2004-3Q 2015 [online]. [cited 2015 Dec 15]. http://www.jointcommission.org/assets/1/18/Root_Causes_Event_Type_2004-3Q_2015.pdf
2. Institute of Medicine. Health literacy and numeracy workshop summary [online]. 2014 [cited 2015 Dec 24] http://www.nap.edu/catalog/18660/health-literacy-and-numeracy-workshop-summary
3. Susan Cosgrove, Project Manager, Team Leader of Health Literacy Initiatives at the Health Care Improvement Foundation. Personal email communication with Pennsylvania Patient Safety Authority. 2016 Jan 5.
4. Jin J, Sklar GE, Sen Oh VM, et al. Factors affecting therapeutic compliance: a review from the patient's perspective. Ther Clin Risk Manag 2008 Feb [cited 2016 Mar 23]. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2503662/
5. Nielsen-Bohlman L, Panzer AM, Kindig DA, et al. Health literacy: a prescription to end confusion. 2004 [online] Washington DC: National Academy of Sciences [cited 2015 Jan 7]. https://iom.nationalacademies.org/Reports/2004/Health-Literacy-A-Prescription-to-End-Confusion.aspx
6. Wu HW, Nishimi RY, Page-Lopez CM, Kizer KW. National Quality Forum: improving patient safety through informed consent for patients with limited health literacy: an implementation report [online]. 2005 [cited 2015 Dec 31]. http://www.qualityforum.org/Publications/2005/09/Improving_Patient_Safety_Through_Informed_Consent_for_Patients_with_Limited_Health_Literacy.aspx
7. Applebaum PS. Assessment of patient's competence to consent to treatment. *NEJM* 2007;357:1834-1840.
8. Weiss BD. *Removing barriers to better, safer care. Health literacy and patient safety: help patients understand: manual for clinicians*, 2nd ed. [online]. 2007 [cited 2016 Jan 8]. http://www.med.fsu.edu/userFiles/file/ahec_health_clinicians_manual.pdf
9. Kutner M, Greenberg E, Jin Y, et al. The health literacy of America's adults: results from the 2003 National Assessment of Adult Literacy (NCES 2006–483) [online]. 2006 [cited 2016 Feb 26] Washington, DC: U.S. Department of Education, National Center for Education. http://nces.ed.gov/pubs2006/2006483.pdf
10. Centers for Disease Control and Prevention. Health literacy for public health professionals: health literacy in the United States [online]. [cited 2016 Mar 23]. http://www.cdc.gov/healthliteracy/training/page669.html
11. Wolf MS, Gazmararian JA, Baker DW. Health literacy and functional health status among older adults. *Arch Intern Med* 2005;165:1946-52.
12. Baker DW, Wolf M, Feinglass J, et al. Health literacy and mortality among elderly persons. *Arch Intern Med* 2007;167(14):1503-9.
13. Baker DW, Gazmararian JA, William MV, et al. Functional health literacy and the risk of hospital admission among Medicare

©2016 Pennsylvania Patient Safety Authority

managed care enrollees. *Am J Public Health* 2002;92:1278-83.

14. DeWalt DA, Hink A. Health literacy and child health outcomes: a systematic review of the literature. *Peds* 2009;124(Suppl3):S265-74.
15. Sudore RL, Schillinger D. Interventions to improve care for patients with limited health literacy. *J Clin Outcomes Manag* 2009 Jan 1;16(1):20-9.
16. Centers for Disease Control and Prevention. Simply put: a guide for creating easy-to-understand materials 3rd ed. [online]. 2009 Apr [cited 2015 Dec 23]. http://www.cdc.gov/healthliteracy/pdf/Simply_Put.pdf
17. Centers for Disease Control and Prevention. Plain language thesaurus for health communications [online]. 2007 Oct [cited 2015 Dec 23]. http://depts.washington.edu/respcare/public/info/Plain_Language_Thesaurus_for_Health_Communications.pdf
18. Plain Language Action and Information Network (PLAIN). Federal plain language guidelines: plain language: improving communication from the Federal Government to the public [online]. 2011 [cited 2015 Jan 8]. http://www.plainlanguage.gov/index.cfm
19. American Congress of Obstetricians and Gynecologists Committee on Ethics. Informed consent [online]. 2009 Aug, No. 439 [cited 2016 Feb 9]. http://www.acog.org/Resources-And-Publications/Committee-Opinions/Committee-on-Ethics/Informed-Consent
20. Dathatri S, Gruberg L, Anand J, et al. Informed consent for cardiac procedures: deficiencies in patient comprehension with current methods. *Ann Thorac Surg* 2014;97:1505-12.
21. Khan Z, Sayers AE, Khattak MU, et al. A prospective randomized control study on patient's recall of consent after hand surgery: how much they want to know? *Ortho Rev* 2013;5(e32):138-41.
22. Papsin E, Haworth R, Chorney JM, et al. Pediatric otoplasty and informed consent: do information handouts improve parental risk recall? *Int J Ped Oto* 2014;78:2258-61.
23. Saio D, Sewell JL, Day LW. Assessment of delivery methods used in the informed consent process at a safety-net hospital. *Gastro Endo* 2014;80(1):61-8.
24. Agency for Healthcare Research and Quality. AHRQ health literacy universal precautions toolkit, 2nd ed. [online]. [cited 2016 Mar 14]. http://www.ahrq.gov/professionals/quality-patient-safety/quality-resources/tools/literacy-toolkit/index.html
25. Mitoku K, Shimanouchi S. The decision-making and communication capacities of older adults with dementia: a population-based study [online]. 2014 {cited 2016 Feb 26]. http://benthamopen.com/ABSTRACT/TONURSJ-8-17
26. Smebye KL, Kirkevold M, Engedal K. How do persons with dementia participate in decision making related to health and daily care? A multi-case study. *BMC HSR* 2012;12:241-53.
27. Institute for Healthcare Improvement. Delivering great care: engaging patients and families as partners [online]. [cited 2016 Jan 4]. http://www.ihi.org/resources/Pages/ImprovementStories/DeliveringGreatCareEngagingPatientsandFamiliesasPartners.aspx
28. Kilgore C. Improving communication when caring for acutely ill patients with dementia. *Nurs Older People* 2015;27(4):35-8.
29. Hardin SR. Engaging families to participate in care of older critical care patients [online]. *Crit Care Nurse* 2012 Jun;32(3):35-40 [cited 2016 Jan 4]. http://ccn.aacnjournals.org/content/32/3/35.long
30. Holsinger T, Deveau J, Boustani M, et al. Does this patient have dementia? *JAMA* 2007;297:2391-404.
31. Feil M. Family members advocate for improved identification of patients with dementia in the acute care setting. Pa Patient Saf Advis [online] 2016 Mar [cited 2016 Mar 15]. http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2016/Mar;13(1)/Pages/01.aspx
32. Parikh NS, Parker RM, Nurss JR, et al. Shame and health literacy: the unspoken connection. *Patient Edu and Couns* 2009;27(1):33-9.
33. Paasche-Orlow MK, Wolf MS. Evidence does not support clinical screening of literacy. *J Gen Intern Med* 2007;23(1):100-2.
34. Baker DW, Parker RM, Williams MV, et al. The healthcare experience of patients with low literacy. *Arch Fam Med* 1996 Jun;5(6):329-34.
35. Cornett S. Assessing and addressing health literacy. *OJIN* 2009;14(3):Manuscript 2.
36. Egbert N, Nanna K. Health literacy: challenges and strategies. *OJIN* 2009;14(3):Manuscript 1.
37. Agency for Healthcare Research and Quality. The SHARE approach—using the teach-back technique: a reference guide for health care providers [online]. 2014 Jul {cited 2015 Dec 23]. http://www.ahrq.gov/professionals/education/curriculum-tools/shareddecisionmaking/tools/tool-6/index.html
38. National Patient Safety Foundation. Ask me 3 [online]. 2016 [cited 2016 Jan 7]. http://www.npsf.org/default.asp?page=askme3
39. Canadian Public Health Association. Easy does it! Plain language and clear verbal communication training manual [online]. 1998 [cited 2015 Dec 23]. http://www.cpha.ca/uploads/portals/h-l/easy_does_it_e.pdf
40. Doak CC, Doak LG, Root JH. Teaching patients with low literacy skills, 2nd ed. [online]. 2015 [cited 2015 Dec 23]. http://www.hsph.harvard.edu/healthliteracy/resources/teaching-patients-with-low-literacy-skills/
41. Agency for Healthcare Research and Quality. The patient education materials assessment tools (PEMAT) and user's guide: an instrument to assess the understandability and actionability of print and audiovisual patient education materials [online]. 2013 Oct [cited 2016 Mar 29]. http://www.ahrq.gov/professionals/prevention-chronic-care/improve/self-mgmt/pemat/index.html
42. Centers for Disease Control and Prevention. The CDC Clear Communication Index [online]. 2015 Nov 10 [cited 2016 Mar 29]. http://www.cdc.gov/ccindex/
43. State of California Health and Human Services Agency Department of Health Care Services. Readability and suitability of written health education materials [online]. 2011 Aug 19 [cited 2016 Apr 27] at: http://www.dhcs.ca.gov/formsandpubs/Documents/MMCDAPLsandPolicyLetters/APL2011/APL11-018.pdf.
44. Readability formulas. The Fry graph readability formula [online]. [cited 2015 Dec 23]. http://www.readabilityformulas.com/fry-graph-readability-formula.php
45. Readability formulas. The SMOG readability formula [online]. [cited 2015 Dec 23]. http://www.readabilityformulas.com/smog-readability-formula.php
46. Rudd, RE. Guidelines for creating materials: resources for developing and assessing materials [online]. [cited 2016 Feb 11]. https://cdn1.sph.harvard.edu/wp-content/uploads/sites/135/2012/09/resources_for_creating_materials.pdf

©2016 Pennsylvania Patient Safety Authority

Scabies: Strategies for Management and Control

Sharon Bradley RN, CIC
Senior Infection Prevention Analyst

ABSTRACT

Scabies is a highly contagious parasitic infestation of the skin and a clinically significant cause of morbidity, especially among people who are debilitated, immunocompromised, institutionalized, or elderly. The Pennsylvania Patient Safety Authority identified hundreds of scabies reports in the Pennsylvania Patient Safety Reporting System database, including information gaps in scabies-control practices. Implementation of an outbreak control plan is necessary to accurately identify, treat, and isolate individual scabies cases and to prevent and control outbreaks and disruption of facility operations. The key element to avoiding scabies outbreaks and treatment failures is a working knowledge of current scabies clinical indicators, surveillance, transmission, diagnosis, treatment, and control measures. Successful control of a scabies outbreak requires a facility-specific outbreak control plan, including techniques for early case identification and treatment, robust infection and environmental controls, and protocols for communication and education. (Pa Patient Saf Advis 2016 Jun;13[2]:66-73.)

Scan this code with your mobile device's QR reader to access the Authority's toolkit on this topic.

INTRODUCTION

Scabies is a highly contagious skin infestation caused by the parasite *Sarcoptes scabiei* mite.[1,2] The risk of scabies is increased for individuals who are immunocompromised or elderly in settings where close body and skin contact is common, such as in healthcare facilities or institutions.[3,4] Scabies manifests in two ways: classic (typical) and crusted (atypical).[3] Classic scabies is characterized by a raised rash and intense itching. In classic scabies cases, the person may be infested with 15 mites or fewer.[3] Crusted scabies is a hyper-infestation that is often unrecognized and difficult to eradicate; in this form of the disease, thick crusted areas of skin contain thousands of mites.[4] Mite infestation and accompanying scratching of the skin can cause lesions resulting in secondary infection or even death from sepsis.[5,6] Scabies outbreaks can result from delayed or incorrect diagnosis or improper treatment of scabies infestation.[1]

SCABIES IN PENNSYLVANIA HEALTHCARE FACILITIES

Pennsylvania Patient Safety Authority analysts queried the Pennsylvania Patient Safety Reporting System (PA-PSRS) database for scabies events reported from nursing homes from April 2014 (when nursing homes began reporting scabies) through November 2015 and from Pennsylvania hospitals and ambulatory surgical facilities (ASFs) from June 2004 (when the acute-care facilities first began reporting events) through November 2015. Pennsylvania nursing homes are also required by PA Code § 211.1. to report cases of scabies to the appropriate Division of Nursing Care Facilities field office.[7] The PA-PSRS scabies criteria mirrors the 2014 revised McGeer criteria for long-term care.[8] For more information see "Surveillance Criteria to Identify Scabies Cases." The database was searched for indication of outbreaks, which were defined as three or more cases within a four-week period.[9]

Pennsylvania nursing homes reported 484 cases of scabies and 37 outbreaks. One hundred ten scabies events were reported from hospital inpatient, emergency, and outpatient settings, as well as from ASFs, with one outbreak occurring in a psychiatric unit (Table 1). Event report narratives from hospital and ASF settings identified problems associated with inadequate communication to receiving units or facilities, including delays in diagnosis, treatment, and instituting precautions; cancelled surgeries; and unrecognized contacts resulting in exposures.

The following are de-identified examples of scabies event narratives reported to the Authority from hospitals and ASFs:*

> *The patient was transferred from another facility with an active scabies infection and was targeted for standard isolation room. The handoff from the emergency department was given with no verbal or written documentation of scabies infection. Contact precautions were delayed and four staff members were exposed.*
>
> *A technician went into the patient's room to draw blood, and the nurse told her to be careful because the patient had scabies. There was no contact-precautions sign posted to indicate this.*
>
> *The physician performed scabies scraping on a patient with positive results but did not communicate this to the nursing staff, and the patient was not on contact precautions for four hours.*

* The details of the PA-PSRS event narratives in this article have been modified to preserve confidentiality.

©2016 Pennsylvania Patient Safety Authority

SURVEILLANCE CRITERIA TO IDENTIFY SCABIES CASES

Both criteria 1 and 2 must be present.

Criteria 1. The following:

— A maculopapular and/or itching rash

Criteria 2. At least one of the following:

— Physician diagnosis

— Laboratory confirmation by means of scraping or biopsy

— Epidemiologic link to a case of scabies with laboratory confirmation

Note: Rule out rashes due to skin irritation, allergic reactions, eczema, psoriasis, and other noninfectious skin conditions. Consider an epidemiologic linkage to a case if there is evidence of a common source of exposure.

Source: Stone ND, Ashraf MS, Calder J, et al. Society for Healthcare Epidemiology Long-Term Care Special Interest Group. Surveillance definitions of infections in long-term care facilities: revisiting the McGeer criteria. *Infect Control Hosp Epidemiol* 2012 Oct;33(10):965-77. Also available: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3538836/

A patient was transported from emergency [department] to imaging with a large, red, scaly appearing rash. [Staff was] not wearing personal protective equipment. The technician was not informed of the rash or possible contagious scabies infestation until returning the patient to emergency [department]. There was no isolation band on the patient and not marked in computer or chart.

Surgery was cancelled after admission and sedation because it was determined by physician that the patient had scabies.

SCABIES CLINICAL INDICATORS

A working knowledge of scabies clinical indicators is critical to avoid scabies treatment failures and outbreaks. The Authority has developed a graphic displaying the key elements of scabies transmission, symptoms, diagnosis and control (Figure).

TRANSMISSION

Scabies is predominantly spread by direct skin-to-skin contact during patient care activities such as physical assessment or assisting with activities of daily living. Mites cannot jump or fly, but they can crawl about 2.5 cm per minute under the skin.[9,10] Scabies can also be spread by indirect contact with fomites such as clothing, linens, and upholstered furniture used by people with crusted scabies.[1] Topical lotions or medications can serve as a reservoir for mites as they can survive up to seven days in oil-based solutions.[11]

Once a fertilized female mite transfers to the host's skin by direct contact, she penetrates and tunnels under the surface layer of the skin and repeatedly deposits two to three eggs a day in her burrow during her two-month lifespan.[1,12] The female mite is harbored in a small vesicle at the end of the burrow.[1] The egg larvae hatch in 3 to 4 days, surface, burrow, and feed on skin cells until they mature over 7 to 10 days, after which the fertilization and burrowing cycles repeat.[1,2] Scratching the itchy skin can result in harboring mites under the fingernails, which then can spread the infestation to other parts of the body, new hosts, or fomites.

Table 1. Hospital and Nursing Home Scabies Cases

SETTING	TIME FRAME	NUMBER OF CASES	OUTBREAKS
Hospital inpatient medical, surgical, specialty, and psychiatric units, imaging, and laboratories*	June 2004 through November 2015	70	1 psychiatric unit outbreak for 3 total cases
Hospital outpatient, emergency department, and ultrasound*	June 2004 through November 2015	33	None reported
Ambulatory surgical facility*	June 2004 through November 2015	7	None reported
Nursing homes†	April 2014 through November 2015	484	37 outbreaks ‡

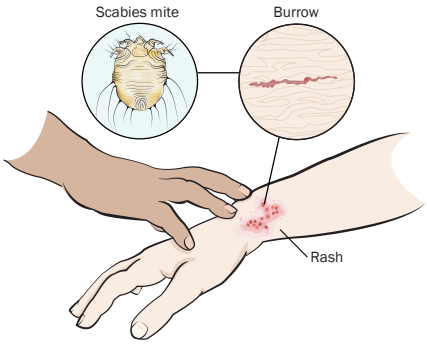
* Hospital and ambulatory surgical facility case reports found in PA-PSRS.

† Nursing homes began reporting scabies cases through PA-PSRS in April 2014.

‡ Five of the 37 nursing home outbreaks totaled 272 cases.

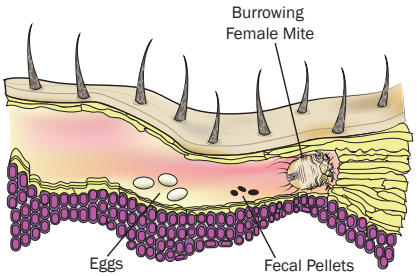
©2016 Pennsylvania Patient Safety Authority

Scabies Transmission, Symptoms, Diagnosis, and Control



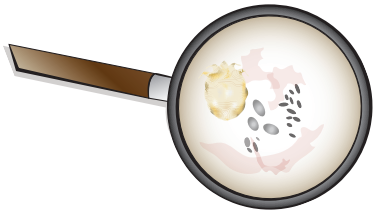
TRANSMISSION

Scabies are transferred from an infested host to a new host by skin-to-skin contact and in severe cases from infested clothing, bedding, or the environment.



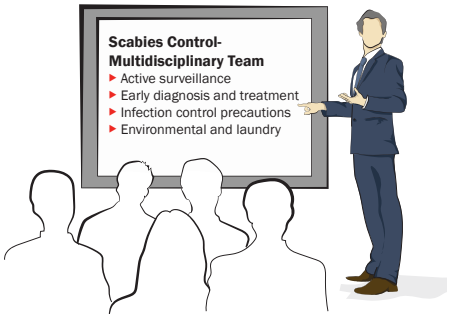
SYMPTOMS

Symptoms of raised rash and intense itching are caused by an allergic reaction to the mites, burrow, eggs, and fecal pellets under the skin.



DIAGNOSIS

Scabies mites, eggs, burrows, and fecal pellets can be identified microscopically from skin scrapings, needle removal of the mite, or by the adhesive tape test.



CONTROL AND PREVENTION

Scabies outbreaks can be controlled by early diagnosis, early concurrent treatment with scabicide and environmental and textile cleaning, contact prophylaxis, education, and communication as part of a written scabies outbreak control plan.

MS16370

©2016 Pennsylvania Patient Safety Authority

Transmission can continue until the mites and eggs are killed by treatment, environmental disinfection, or after three to four days off the skin.[1] Persons with severe or crusted scabies can shed thousands of live mites into the environment.[1,3]

Symptoms

A person infested with typical scabies usually presents with severe itching intensified at night, a generalized raised or blistered rash on the skin folds of fingers, buttocks, genitalia, breasts, wrists, elbows, and axilla, or lesions associated with burrows. According to the Centers for Disease Control and Prevention (CDC), the rash in bedbound patients may be more noticeable on patients' backs, buttocks, and legs.[3] An allergic reaction to the mites, their saliva, eggs, or fecal material results in the rash and itching.[5] Scabies mites are microscopic, but the burrows may be visible with a handheld magnifying glass as centimeter-long, tiny, grayish-white or red raised wavy lines under the skin.[12]

The first time a person is infested with scabies, he or she may have no symptoms during the four- to six-week incubation period but can still spread mites during this time.[13] Individuals with previous scabies infestations are more sensitive and become symptomatic in one to four days. Delayed diagnosis or treatment and scratching, which opens a portal of entry for pathogens, may result in secondary skin infections such as bacterial skin infections, impetigo, cellulitis, or post-streptococcal glomerulonephritis.[5,6]

Crusted scabies can manifest as hyperkeratotic nails and thick crusts or scales on the skin harboring thousands of scabies mites and eggs.[6] These thick, sometimes fissured crusts generally involve the hands and feet but can be found elsewhere on the body.[6] The presence of itching may be variable in persons with crusted scabies or altered immune response.[10]

Surveillance and Outbreak Criteria

A high suspicion of scabies is warranted in persons with persistent, undiagnosed rashes and itching, new complaints of rash and itching every four to six weeks, thick crusted skin surfaces, or if there is evidence of a common source of exposure to an active case.[4] Surveillance and case findings are critical to determine the location and scope of an outbreak, the possible outbreak source person, its ongoing transmission, and the end of the outbreak; reporting and communicating with outside sources, such as the local health department, also is critical.

The New Jersey Department of Health has defined a scabies outbreak in a long-term care or residential facility as "one or more laboratory confirmed cases of scabies (via positive skin scraping), or at least two clinically suspected cases (clinically diagnosed and treated individuals) in residents, healthcare providers, visitors or volunteers within a four-week period of time."[9] The Pennsylvania code of communicable and non-communicable diseases defines an outbreak as an unusual increase in the number of cases of a disease, infection or condition, whether reportable or not as a single case, above the number of cases that a person required to report would expect to see in a particular geographic area or among a subset of persons (defined by a specific demographic or other features.[14]

Diagnosis

Scabies can be diagnosed by the clinical manifestation; an ink test to identify a burrow; the examination of skin scrapings for mites, their eggs, or fecal matter using a microscope (dermatoscopy); or by an adhesive tape test to visualize mites.[15-17] A negative skin scraping might not rule out active scabies because the small number of mites in a classic scabies case may make the burrows hard to visualize.[3] In a 2011 systematic review of diagnostic methods for scabies, Leung and Miller describe the key steps to perform an accurate skin scraping or burrow ink test.[16] Katsumata and Katsumata described a simple method to detect scabies by transferring mites from the patient's skin on the sticky side of transparent adhesive tape to a slide, enabling microscopic visualization of mites moving around in the space between the slide and the tape. Detecting mites by this method is most effective when the tape is applied to the thin skin of the toes and fingers.[17] For more information, see "Key Steps to Identify Scabies."

Scabies can be misdiagnosed as psoriasis, eczema, contact dermatitis, impetigo, insect bites, or non-specific dermatitis.[15] The severity of the infestation may progress extensively before being noticed, because of the long incubation period in first-time cases or misdiagnosis and subsequent delay in treatment, which provides a significant opportunity to transmit the scabies mite to others. CDC recommends consulting with a dermatologist experienced in confirming the diagnosis of scabies, and in cases of crusted scabies, ensuring that a staff member is trained to perform a microscopic skin scraping for scabies mites and material.[4]

Treatment

Synchronous treatment is appropriate for the infested person, for those with close personal contact with an infested person in the previous four weeks, or in the case of crusted scabies, for those who have had contact with the linens or environment of the infested person.[13] Prescription scabicides are used to kill scabies mites and their eggs.[13] Carefully select a scabicide: some products may not be safe for children or pregnant women, may cause skin irritation, or may be neurotoxic. The advantages, disadvantages, and contradictions for specific medications and treatment regimens are detailed on the CDC scabies website.[18]

©2016 Pennsylvania Patient Safety Authority

KEY DIAGNOSTIC STEPS TO IDENTIFY SCABIES

Burrow Ink TEST[1]

— Identify the burrow using a handheld magnifying glass in an area not excoriated by scratching.

— Gently rub ink from a felt tip or fountain pen over a suspected burrow.

— Gently wipe off the excess ink with an alcohol swab.

— Visualize the burrow where the ink has been absorbed into the burrow tunnel.

Skin Scraping (Dermatoscopy)[2]

— Identify the burrow using a handheld magnifying glass or the burrow ink test in an area not excoriated by scratching.

— Prepare the skin site and the slide with a drop of mineral oil.

— Gently scrape the skin off the burrow with a blunt scalpel blade or the edge of the glass slide.

OR

— Use the tip of a sterile needle and a drop of mineral oil to remove the scabies mite from the end of its burrow.

— Place a cover slip over the slide and repeat for about 4 to 6 scrapings for each patient.

— Transfer the slide to the laboratory or have a trained person examine the slide under a microscope.

Adhesive tape TEST[3]

— Cut a section of strong transparent adhesive tape the same size as a glass slide.

— Press the strip of adhesive tape onto a suspected scabies lesion on the patient's skin.

— Wait several seconds, then pull tape off the skin.

— Transfer the adhesive side of the tape directly onto a glass slide.

— Use a microscope to visualize mites between the slide and the tape.

Notes

1. Leung V, Miller M. Detection of scabies: a systematic review of diagnostic methods. *Can J Infect Dis Med Microbiol* 2011;22(4):143-6.

2. Cahill CK, Rosenberg J, Schweon SJ, et al. Scabies surveillance, prevention, and control. *Ann Long Term Care* 2009 Apr 22;17(4):31-5.

3. Katsumata K, Katsumata K. Simple method of detecting sarcoptes scabiei var hominis mites among bedridden elderly patients suffering from severe scabies infestation using an adhesive-tape. *Intern Med* 2006;45(14):857-9.

Synchronous treatment with both an oral antiparasitic and a topical scabicide has been effective for cases of crusted scabies or failed treatment, and oral alone for cases of intolerance to topical solutions.[1,13,18] Crusted scabies requires at least two treatments, about a week apart.[4]

Softening and removing scaly crusts from the skin and from under the nails enhances penetration of the scabicide. This can be accomplished by loosening the hardened skin with application of a keratolytic agent, brushing off the crusts, and trimming the nails and massaging the scabicide under fingernails and toenails.[10,18,19] Avoid skin-to-skin contact for at least eight hours after treatment.[20]

Persistent itching may be present for several weeks after treatment as the dead mites, eggs, eggshells, and fecal pellets emerge from the burrows.[9,13] If weekly skin assessments find persistent itching or new burrows more than two to four weeks after the last treatment, repeat treatment may be necessary.[9,20] Suspect treatment failure when persistent, intensified or new lesions appear within two to four week of treatment. For more information, see "Key Factors is Scabies Treatment Failures."

SCABIES OUTBREAK CONTROL PLAN

An outbreak control plan is essential to prevent the morbidity, potential mortality, and significant operational burden associated with a scabies outbreak. Outbreaks often result in the following:

– Unplanned use of scarce facility resources to manage infected patient

– Staff sick leave and overtime

– Additional healthcare supplies and cleaning expenses

– Lost revenue from temporary closures of affected units

– Irrational panic among staff

A written outbreak control plan is best coordinated with a multidisciplinary team. A robust plan includes developing and implementing measures for early detection and treatment of new scabies cases, using contact prophylaxis, employing infection and environmental controls, ensuring good communication, and providing education.[20] It is essential to review and confirm the effectiveness of outbreak-control activities after an outbreak has resolved.[9] The Authority's accompanying Scabies Outbreak Control Checklist tool (http://patientsafetyauthority.org/EducationalTools/PatientSafetyTools/Pages/home.aspx) provides a structure to identify gaps in readiness plans,

©2016 Pennsylvania Patient Safety Authority

KEY FACTORS IN SCABIES TREATMENT FAILURES

- Incorrect diagnosis.[1]
- Failure to follow the topical scabicide directions for first and second applications.[1]
- Insufficient penetration of scabicide into crusted lesions or under nails.[1]
- Re-infestation due to continued exposure to other, active scabies cases.[1]
- Failure to remove mites from linens and the environment.[1]
- Failure of immunosuppressed patients to respond to treatment.[2]

Notes

1. Management of scabies in long-term care facilities, schools and other institutions. [internet]. Trenton (NJ): New Jersey Department of Health; 2014 Jul [accessed 2014 Jan 18]. [21 p]. Available from Internet: http://www.state.nj.us/health/cd/documents/faq/scabies_guidance.pdf
2. Cahill CK, Rosenberg J, Schweon SJ, et al. Scabies surveillance, prevention, and control. *Ann Long Term Care* 2009 Apr 22;17(4):31-5.

investigate scabies cases, and control outbreaks. Control measures are considered effective and the outbreak resolved when no new cases are identified within two six-week incubation periods or twelve weeks. This allows for weekly assessment and recognition of asymptomatic secondary cases while still in the incubation period.[1,9]

Early Detection and Treatment

The following actions provide early detection and treatment:

- Institute heightened surveillance during admission assessments for rapid detection of symptoms and secondary infections.[3,4,9]
- Confirm cases and outbreak definitions, and discuss control strategies with local or state health departments.[4,6]
- Institute a line listing to track and identify the index case, trends, timelines, and locations for patient, staff, and volunteer or family cases.[20]
- Use a line patient and staff listing to track outbreak parameters; one is available at: http://patientsafetyauthority.org/EducationalTools/PatientSafetyTools/Pages/home.aspx.
- Train a clinician to perform skin scrapings in the event of a persistent outbreak and ensure access to testing supplies.[4]
- Treat all infested persons and their asymptomatic contacts at the same time to avoid reinfestation.[20]
- Furlough healthcare workers with symptoms of scabies until 24 hours after treatment. Continue the use of personal protective equipment (PPE) for a few days to be sure they are no longer infested.[9,21]
- Provide prophylactic treatment for everyone who has had skin-to-skin contact with individuals with scabies or exposure to the environment of individuals with crusted scabies.[4,20]
- Consider facility-wide mass prophylaxis for residents, staff, volunteers, and others, based on several factors:
  - The amount of time diagnosis, treatment, and isolation was delayed
  - The number of symptomatic or suspected cases
  - The mobility of patients and staff
  - Whether there are any cases of the highly transmissible crusted scabies[1,20]

Infection and Environmental Controls

The following actions provide infection and environmental control:

- Institute contact precautions for patient care, housekeeping, and laundry activities until 24 hours after treatment is started for individuals with scabies, and clean the environment.[1,4,9]
- Provide clear descriptions about how to implement contact precautions for scabies; consider practicing job-specific steps in a clinical scenario or simulation exercise.
- Consider enhanced precautions for persons with crusted scabies, including separating from classic scabies cases, cohorting staff, and continuing contact precautions until successful treatment has been verified.[4]
- Synchronize environmental cleaning with treatment or prophylaxis.[9]
- Limit visitors or require use of PPE.[20]
- Remove or kill scabies mites by collecting fabrics used in at least the last 3 days in a plastic bag, then wash and dry on the hot cycle (122 degrees Fahrenheit), dry clean, or remove from use or body contact for at least 72 hours.[3]
- Disinfect shared equipment such as wheel and shower chairs and blood pressure cuffs.[9]
- Thoroughly vacuum room, furniture, and carpet daily to remove contaminated skin cells shed from crusted scabies cases. Change vacuum bag daily.[3,9]

Communication and Education

To provide communication and education, take the following steps:

- Communicate job-specific information explaining scabies transmission, symptoms, surveillance, diagnosis, and treatment. Reinforce required

©2016 Pennsylvania Patient Safety Authority

activities using educational modalities such as simulation exercises or posters and handouts of scabies fact sheets.[20]

- Train and hold healthcare workers accountable for identifying, reporting, and documenting suspicious skin conditions.[1]
- Establish a multidisciplinary process and accountable personnel to identify and notify contacts, institute visitor restrictions, and coordinate local and state health department and media contacts as necessary.[9,20]
- Establish a relationship with a consultant dermatologist to provide information and dermatologic consultation to individuals with scabies or their contacts.[1,9]

Limitations

Limitations of this study are that scabies may be under-reported in hospitals and ASFs because the HAI event taxonomy in PA-PSRS does not include scabies infestations. In Pennsylvania, hospitals are obligated to report infections only to the CDC National Healthcare Safety Network (NHSN), which does not collect reports on scabies infestations. Additionally, scabies outbreak definitions vary from state to state. Finally, the nursing home reporting system captures criteria but not narrative information.

In terms of limitations in healthcare settings, in a setting such as nursing homes, it can be challenging to access a microscope or obtain a dermatology consult for timely diagnosis.

CONCLUSION

Pennsylvania hospitals, ASFs, and nursing homes have reported scabies cases, outbreaks, and delays in diagnosis, treatment, and isolation, as well as communication failures through PA-PSRS event reports. Much of the morbidity, mortality, and operational disruption associated with scabies outbreaks is preventable. The most important risk-reduction strategies are timely and accurate identification, treatment, and isolation of scabies cases; environmental control; and development of a facility-specific outbreak control plan. For this reason, it is important to raise awareness and identify the gaps in a healthcare facility's ability to respond to scabies before an outbreak ensues. The Authority's Scabies Outbreak Control Checklist can be a useful tool to identify gaps in facility practices and to target resources and accountability for implementation of appropriate risk reduction strategies.

Acknowledgment

Edward Finley, BS, Senior Data Analyst, Pennsylvania Patient Safety Authority, provided data analysis expertise.

NOTES

1. Cahill CK, Rosenberg J, Schweon SJ, et al. Scabies surveillance, prevention, and control. *Ann Long Term Care* 2009 Apr 22;17(4):31-5.
2. Scabies—epidemiology and risk factors. [internet]. Atlanta (GA): Centers for Disease Control and Prevention (CDC); 2010 Nov 2 [accessed 2016 Jan 18]. Available: http://www.cdc.gov/parasites/scabies/epi.html
3. Scabies—general information FAQs. [internet]. Atlanta (GA): Centers for Disease Control and Prevention (CDC); 2010 Nov [cited 2016 Jan 18]. Available: http://www.cdc.gov/parasites/scabies/gen_info/index.html
4. Scabies—crusted scabies cases (single or multiple). [internet]. Atlanta (GA): Centers for Disease Control and Prevention (CDC); 2010 Nov 2 [cited 2016 Jan 18]. Available: http://www.cdc.gov/parasites/scabies/health_professionals/crusted.html
5. Scabies—disease. [internet]. Atlanta (GA): Centers for Disease Control and Prevention (CDC); 2010 Nov 2 [cited 2016 Jan 18]. Available: http://www.cdc.gov/parasites/scabies/disease.html
6. McCarthy JS, Kemp DJ, Walton SF, Currie BJ. Scabies: more than just an irritation. *Postgrad Med J* 2004 Jul;80(945):382-7. Also available: http://dx.doi.org/10.1136/pgmj.2003.014563
7. Title 28, Pennsylvania Code, § 211 - Program standards for long-term care nursing facilities. http://www.pacode.com/secure/data/028/chapter211/chap211toc.html.
8. Stone ND, Ashraf MS, Calder J, et al. Society for Healthcare Epidemiology Long-Term Care Special Interest Group. Surveillance definitions of infections in long-term care facilities: revisiting the McGeer criteria. *Infect Control Hosp Epidemiol* 2012 Oct;33(10):965-77. Also available: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3538836/
9. Management of scabies in long-term care facilities, schools and other institutions. [internet]. Trenton (NJ): New Jersey Department of Health; 2014 Jul [cited 2014 Jan 18]. [21 p]. http://www.state.nj.us/health/cd/documents/faq/scabies_guidance.pdf
10. Wilson MM, Philpott CD, Breer WA. Atypical presentation of scabies among nursing home residents. *J Gerontol A Biol Sci Med Sci* 2001 Jul;56(7):M424-7
11. Arias KM. Association for Professionals in Infection Control and Epidemiology. Quick reference to outbreak investigation and control in healthcare facilities. Gaithersburg (MD): Aspen Publishers; 2000. Organisms and disease associated with outbreaks. p. 144-6.
12. Scabies—biology. [internet]. Atlanta (GA): Centers for Disease Control and Prevention (CDC); 2010 Nov [cited 2016 Jan 18]. http://www.cdc.gov/parasites/scabies/biology.html
13. Scabies—treatment. [internet]. Atlanta (GA): Centers for Disease Control and Prevention (CDC); 2015 Sep [cited 2016 Jan 18]. http://www.cdc.gov/parasites/scabies/treatment.html
14. Title 28, Pennsylvania Code, § 27 - Communicable and non-communicable diseases. http://www.pacode.com/secure/data/028/chapter27/chap27toc.html
15. Scabies—diagnosis. Atlanta (GA): Centers for Disease Control and Prevention (CDC); 2010 Nov [cited 2016 Jan 18]. http://www.cdc.gov/parasites/scabies/diagnosis.html

©2016 Pennsylvania Patient Safety Authority

16. Leung V, Miller M. Detection of scabies: A systematic review of diagnostic methods. *Can J Infect Dis Med Microbiol* 2011;22(4):143-6.
17. Katsumata K, Katsumata K. Simple method of detecting sarcoptes scabiei var hominis mites among bedridden elderly patients suffering from severe scabies infestation using an adhesive-tape. *Intern Med* 2006;45(14):857-9.
18. Scabies—medications. Atlanta (GA): Centers for Disease Control and Prevention (CDC); 2015 Sep 15 [cited 2016 Jan 18]. http://www.cdc.gov/parasites/scabies/health_professionals/meds.html
19. Paasch U, Haustein UF. Management of endemic outbreaks of scabies with allethrin, permethrin, and ivermectin. *Int J Dermatol* 2000 Jun;39(6):463-70.
20. Scabies—prevention and control. [internet]. Atlanta (GA): Centers for Disease Control and Prevention (CDC); 2010 Nov 2 [accessed 2016 Jan 18]. Available: http://www.cdc.gov/parasites/scabies/prevent.html
21. Scabies—workplace frequently asked questions (FAQs). [internet]. Atlanta (GA): Centers for Disease Control and Prevention (CDC); 2013 Jul 19 [cited 2016 Jan 18]. http://www.cdc.gov/parasites/scabies/gen_info/faq_workplace.html

©2016 Pennsylvania Patient Safety Authority

Data Snapshot: *Clostridium difficile* Infections in Long-Term Care Facilities

JoAnn Adkins, RN, BSN, CIC
Infection Prevention Analyst
Pennsylvania Patient Safety Authority

Upon its original publication in June 2016, this article contained statements and data representations in error. This current version includes corrections.

Clostridium difficile (*C. diff*) infection is a difficult-to-treat disease that may affect patients in healthcare facilities and can cause severe diarrhea and even death. *C. difficile* infection (CDI) can be devastating to anyone, but it is especially worrisome in the elderly because older people are more susceptible to developing CDIs and have a higher mortality rate.[1] In the United States, more than 80% of the deaths associated with CDI occur in people age 65 or older. *C. diff* causes almost half a million infections yearly, with more than 100,000 occurring among residents in long-term care, making it one of the most serious healthcare complications for residents.[1,2] Inappropriate or unnecessary antibiotic use and inadequate infection-prevention practices may increase the transmission of *C. diff* in a facility and from one facility to another when infected patients are transferred.[1,2] Although the incidence of CDI is decreasing in Pennsylvania long-term care facilities, diligence remains important because of the high incidence of CDI nationally and the significant mortality of CDI in elderly people.

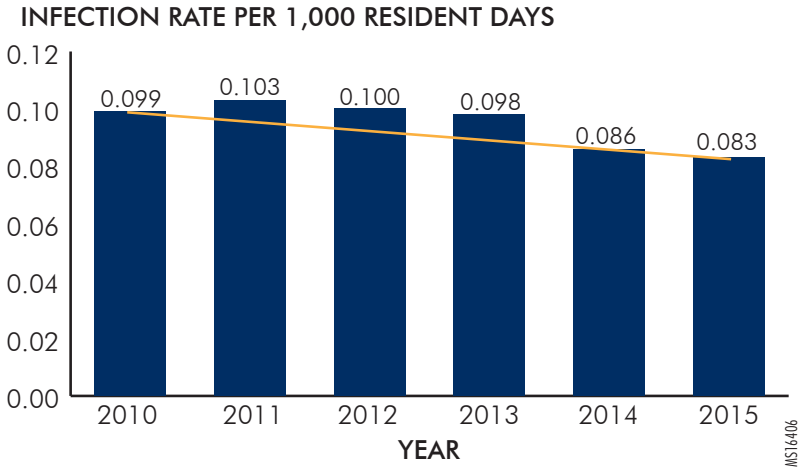
Between January 2010 and December 2015, Pennsylvania long-term care facilities (LTCFs) reported 13,100 CDIs to the Pennsylvania Patient Safety Authority. The CDI rate in Pennsylvania LTCFs in that period shows modest yearly decreases with an overall decrease of 16% (Figure 1).

The Southcentral and Southwest regions had higher rates of CDI than the other regions of the state for the period January 1, 2010, through December 31, 2015. The Table lists CDI rate by region.

The Northeast region had an increase in CDI from baseline year of 2010 compared with 2015; however, it has had consistently low rates. The other five regions had decreases in CDI, with the Southcentral and Northwest regions having the most significant decreases (Figure 2).

Strategies to reduce and prevent CDI in LTCFs include a combination of antimicrobial stewardship and infection-prevention practices. Prudent use of antibiotics is necessary because antibiotic exposure is a major risk factor for the acquisition of *C. diff*. This

Figure 1. CDI Rates in Pennsylvania Long-Term Care Facilities, as Reported to the Pennsylvania Patient Safety Authority, 2010 through 2015



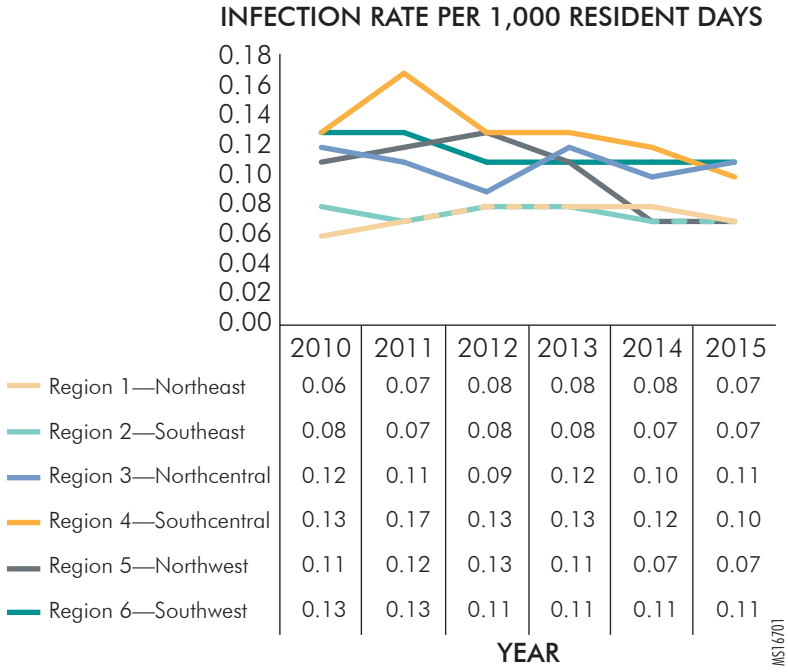
CDI, *Clostridium difficile* infection.

©2016 Pennsylvania Patient Safety Authority

Table. CDI Rates in Pennsylvania Long-Term Care Facilities by Region, as Reported to the Pennsylvania Patient Safety Authority, 2010 through 2015 (N = 13,100)

REGION	*CLOSTRIDIUM DIFFICILE* INFECTION RATE PER 1,000 RESIDENT DAYS
Region 1 – Northeast	0.07 (n = 1,393)
Region 2 – Southeast	0.07 (n = 3,715)
Region 3 – Northcentral	0.11 (n = 878)
Region 4 – Southcentral	0.13 (n = 2,607)
Region 5 – Northwest	0.10 (n = 1,451)
Region 6 – Southwest	0.12 (n = 3,056)

Figure 2. Changes in CDI Rates in Pennsylvania Long-Term Care Facilities, as Reported to the Pennsylvania Patient Safety Authority, 2010 through 2015



CDI, *Clostridium difficile* infection.

includes avoiding antibiotic therapy when it is not indicated, such as for asymptomatic bacteruria, and selecting narrow-spectrum antibiotics that are associated with a lower CDI risk.[3-5] Tools to help facilities develop antibiotic stewardship programs are provided in the *Pennsylvania Patient Safety Advisory* articles "Antibiotic Stewardship in Hospitals and Long-Term Care Facilities: Building an Effective Program"[4] and "Strategies to Turn the Tide against Inappropriate Antibiotic Utilization."[5] Infection-prevention practices are important to reduce transmission. *C. diff* forms spores that are resistant to many commonly used disinfectants and to the bactericidal effects of alcohol.

Effective infection prevention practices include:

- Hand hygiene
- Immediate implementation of full barrier contact precautions for patients with CDI
- Environmental cleaning with sodium hypochlorite (bleach) or a sporicidal disinfectant approved by the Environmental Protection Agency (EPA)
- Identification and testing of residents with diarrhea for CDI, especially if they have had recent antibiotic therapy
- Communication with transferring facilities if a resident has a CDI
- Education of staff, residents, and visitors[1-3,6-9]

CDI is a serious disease that can cause significant morbidity and mortality, especially in the elderly. Using appropriate antibiotics and implementing effective infection-prevention practices along with active surveillance for potential CDI cases can help facilities prevent transmission of *C. diff*.

©2016 Pennsylvania Patient Safety Authority

NOTES

1. Centers for Disease Control and Prevention (CDC). Vital signs. Making health care safer - stopping C. difficile infections [online]. 2012 March [cited 2015 Dec 15]. http://www.cdc.gov/vitalsigns/HAI/StoppingCdifficile/index.html
2. Stone N. Dying from C. diff: who is most vulnerable? [online]. Medscape 2015 June 2 [cited 2016 Jan 11]. http://www.medscape.com/viewarticle/845534
3. Chopra T, Goldstein E. Clostridium difficile infection in long-term care facilities: a call to action for antimicrobial stewardship. *Clin Infect Dis* 2015 May 15;60 Suppl 2:S72-6.
4. Bradley S. Antibiotic stewardship in hospitals and long-term care facilities: building an effective program. *Pa Patient Saf Advis 2015 Jun [cited 2016 Jan 11].* http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2015/Jun;12(2)/Pages/71.aspx
5. Adkins J, Bradley S, Finley E. Strategies to turn the tide against inappropriate antibiotic utilization. *Pa Patient Saf Advis* 2015 Dec [cited 2016 Jan 11]. http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2015/Dec;12(4)/Pages/149.aspx
6. Dubberke E, Carling P, Carrico R, et al. Strategies to prevent Clostridium difficile infections in acute care hospitals: 2014 update. *Infect Control Hosp Epidemiol* 2014 Sep;35 Suppl 2:S48-65.
7. Goudarzi M, Seyedjavadi S, Hossein Goudarzi H, et al. Clostridium difficile infection: epidemiology, pathogenesis, risk factors and therapeutic options. *Scientifica (Cairo)* 2014;2014:916826. http://www.hindawi.com/journals/scientifica/2014/916826/
8. Gould C, McDonald LC. Bench-to-bedside review: Clostridium difficile colitis [online]. *Crit Care* 2008;12(1):203 [cited 2016 Jan 11]. http://ccforum.com/content/12/1/203
9. Stokowski L, McDonald LC. Refining our approach to Clostridium difficile prevention [online]. Medscape 2012 Mar 21 [cited 2016 Jan 11]. http://www.medscape.com/viewarticle/760505

SAVES, SAFETY II, AND SYSTEM IMPROVEMENTS

This narrative introduces a new occasional feature of the *Pennsylvania Patient Safety Advisory*, highlighting successes by healthcare workers in keeping our patients safe. Safety-II is an approach that assumes that everyday performance variability provides the adaptations that are needed to respond to varying conditions, and that humans are a resource for system flexibility and resilience. The safety management objective is to understand and facilitate everyday work and to maintain the adaptive capacity to respond effectively to inevitable surprises.[1] System improvements seek to optimize the complex systems that surround and integrate with healthcare workers' efforts to provide safe patient care.

Twice as Much Isn't Twice as Good

Fifty milligrams of a medication was prescribed for a patient. When the patient's registered nurse (RN) pulled the medication out of the automated dispensing cabinet, there were 2 pills, each 50 mg, inside the container, equaling 100 mg, however the label said 50 mg. The RN did not administer the med at this time but called the pharmacy to report the problem and sent the faulty container back to pharmacy. The pharmacist and the RN collaborated on checking the other doses in the cabinet. They found that the other doses in the drawer were correct; each contained one 50 mg pill per container. The RN administered the correct dose to patient.*

This has been identified as a good catch of a dosage error, based on information available in the event narratives in the Pennsylvania Patient Safety Reporting System. The Authority recognizes and applauds the RN and pharmacist for identifying the mislabeled container, realizing that the error could affect more than one container, and taking the time to check the additional containers.

Note

1. Hollnagel E, Wears RL, Braithwaite J. From safety-I to safety-II: a white paper. The Resilient Health Care Net: Published simultaneously by the University of Southern Denmark; University of Florida, USA; and Macquarie University, Australia. 2015. Also available on Internet: http://resilienthealthcare.net/onewebmedia/WhitePaperFinal.pdf

*The details of the PA-PSRS event narrative in this article have been modified to preserve confidentiality.

©2016 Pennsylvania Patient Safety Authority

Update on Wrong-Site Surgery: Use Patient Engagement to Enhance the Effectiveness of the Universal Protocol

Theresa V. Arnold, DPM
Manager, Clinical Analysis
Pennsylvania Patient Safety Authority

From July 2004 through March 2016, 689 wrong-site surgery events were reported through the Pennsylvania Patient Safety Reporting System (PA-PSRS) and analyzed by the Pennsylvania Patient Safety Authority. The three most common types of wrong-site operating room (OR) procedures reported through PA-PSRS since July 2004 continue to persist and account for more than 50% of events (N = 689):

1. Anesthetic blocks by anesthesiologists and surgeons (26.6%, n = 183)
2. Wrong-level spinal procedures (12.8%, n = 88)
3. Pain-management procedures (11.5%, n = 79)

The overall percentage for wrong-site anesthetic blocks decreased slightly from the previous analysis (i.e., 27.4% to 26.6%); however, the percentage of wrong-level spinal procedures and pain-management procedures remained consistent.

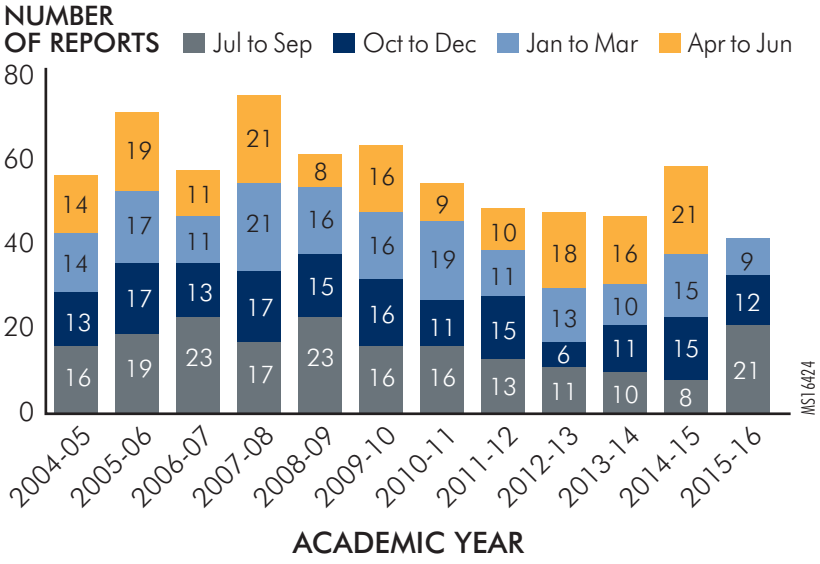
Although the 2014–2015 academic year* proved challenging,[1] the 2015–2016 academic year has shown improvement, especially in the second and third quarters. If the trend of the past two quarters continues into the final quarter, results at the conclusion to the academic year may be comparable to previous years.

Forty-two events were reported from Pennsylvania ORs in the first three quarters of the 2015–2016 academic year; 21 in the first quarter, 12 in the second quarter, and 9 in the third quarter. Wrong-site anesthesia blocks, which predominate in the overall number of events above, accounted for 14.3% (n = 6 of 42), 4 of which were administered by an anesthesiologist and 2 by surgeons.

The other types of wrong-site surgery events were as follows:

– Wrong-side procedures (23.8%, n = 10 of 42), only one of which was identified as an orthopedic procedure

Figure. Pennsylvania Patient Safety Authority Wrong-Site Surgery Reports by Academic Year



Scan this code with your mobile device's QR reader to access the Authority's toolkit on this topic.

* This includes an additional event reported in the third quarter of the 2014-2015 academic year.

©2016 Pennsylvania Patient Safety Authority

- Wrong-side pain-management procedures (e.g., wrong-side spinal injections; 16.7%, n = 7)
- Misidentified spinal levels (14.3%, n = 6)
- Wrong procedures—two of which described the removal of the wrong organ (11.9%, n= 5)
- Wrong-site procedures (11.9%, n = 5), two of which were wrong-site hand procedures (e.g., carpal tunnel release instead of trigger finger release)
- Wrong-side ureteroscopy/ureteral stent placements (7.1%, n = 3)

THE AUTHORITY CELEBRATES 2016 NATIONAL TIME OUT DAY WITH PATIENT-CENTERED POSTER

Although the number of wrong-site events has shown steady, yet slow improvement since the 2007–2008 academic year, 2014–2015 proved to be a challenge for facilities because the number of events increased 25.5% from the previous academic year, which had the lowest number of events reported to the Authority since data collection began in 2004. With implementation of the Universal Protocol, surgical teams have been guided through a three-step process of patient identification, procedure site marking, and time-out.[2] How effectively has this process taken hold in Pennsylvania healthcare facilities providing surgical services? Are surgical teams—and patients—engaged in the process or are they merely going through the motions to follow a policy? Is the process precisely defined or is there significant variation in the manner in which the Universal Protocol is performed—a potential byproduct of a nonprescriptive protocol? Recognizing these possibilities and the current focus on delivering patient-centered care, the Authority captured the elements of the Universal Protocol, simplified it to reflect a patient's perspective of the process, and created a poster: *Patients and Surgical Teams Work Together to Avoid Wrong-Site Surgery*. The poster was released to coincide with the Association of periOperative Registered Nurses (AORN) National Time Out Day celebrated on June 8, 2016.[3]

TIPS FOR SUCCESSFUL PATIENT ENGAGEMENT IN THE UNIVERSAL PROTOCOL

Patients and Surgical Teams Work Together to Avoid Wrong-Site Surgery highlights the three main steps of the Universal Protocol: pre-procedure verification, procedure site marking, and procedure time-out. Although the title speaks to both patients and surgical teams, it emphasizes the *patient* as the first-person narrator. The format serves two purposes: (1) it reminds surgical teams that patient engagement is integral to the process, and (2) it informs patients of the tiered approach the surgical team is expected to complete to ensure that the proper procedure is performed on the correct patient and at the correct site. When demonstrated, explained, and reviewed, this information can empower the patient. Engaging patients as partners may also prove beneficial for surgical teams because patients in this role set a standard for staff accountability to ensure that the process is carried out as anticipated. The elements of the poster follow.

Preoperative Verification

- *Identify* the patient using two forms of identification that require an active response (e.g., "What is your name and date of birth?").[4]
- Meet and *speak* with the patient and their *caregiver* preoperatively to confirm their understanding of the correct *procedure*, *site*, and *side*.[4]
- Ensure that the correct procedure, site, and side are documented on *all* source documents including the OR schedule, informed consent(s), and the patient's history and physical.[2,4] By analyzing events and participating in time-out observations, the Authority realized that the correct site and side are not consistently specified on all source documents.

Procedure Site Marking

- *Include* and use the patient or their caregiver as a resource in marking the site.[2,4] Ensure that the information received from the patient is consistent with all the source documents and with the surgeon's plan recollection of the correct procedure, site, and side.

Reference the Mark Before the Procedure Begins

- *Look* for and use the mark as if it were the "patient's voice" to orient the surgical team to the correct site once the patient is in the OR.[4] Much time and effort is taken to make the mark; recognize the value of that effort by looking for and acknowledging the mark during each and every time-out.
- Ensure that the mark is visible in the prepped and draped field.[2,4]
- Stop all non-life-support activity during the time-out and encourage staff to actively participate (i.e., use active responses to questions rather than mere agreement).[2,4]
- Empower staff to "speak up" on behalf of the patient and the surgical team if any team member has questions or concerns.[2,4]

NOTES

1. Arnold TV. Quarterly update on wrong-site surgery: eleven years of data collection and analysis [online]. Pa Patient Saf Advis 2015 Sep [cited 2016 Apr 29]. http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2015/Sep;12(3)/Pages/119.aspx
2. The Joint Commission. The Universal Protocol for preventing wrong site, wrong procedure, and wrong person surgery [poster online]. [cited 2016 May 1]. http://www.jointcommission.org/assets/1/18/UP_poster1.pdf
3. AORN. National Time Out Day [online]. http://www.aorn.org/aorn-org/temp/national-time-out-day
4. Principles for reliable performance of correct-site surgery [online]. Pa Patient Saf Advis 2011 [cited 2016 Apr 29]. http://patientsafetyauthority.org/EducationalTools/PatientSafetyTools/PWSS/Pages/principles.aspx

©2016 Pennsylvania Patient Safety Authority

That Pesky Human Factor

Ellen S Deutsch, MD, MS, FACS, FAAP, CPPS
Editor, Pennsylvania Patient Safety Advisory
Medical Director, Pennsylvania Patient Safety Authority

When I hear the term "human factor" mentioned in a root-cause analysis or in the discussion of an Incident or Serious Event, I cringe and wait, wondering what the speaker means by that term. I have two concerns, and I look forward to the day when both are unfounded.

My first concern is that mention of "the human factor" is sometimes a code for identifying "what the human did wrong," intended to reference the perception that human fallibility is inevitable. It's true that humans make mistakes. Despite good intentions, our knowledge, judgment, and skills can be imperfect. We know that "to err is human"[1] and are further told that "to err is human – and let's not forget it."[2]

Fortunately, humans have strengths as well as weaknesses. Humans invent. Humans create and develop healthcare advances and solutions. Humans solve problems. Humans learn and improve themselves, their teams, and the complex systems they work within. Humans offer empathy and compassion. Healthcare providers work to provide ever-improving healthcare. In fact, "people working in health care are among the most educated and dedicated work force in any industry."[1] The Pennsylvania Patient Safety Authority celebrates these attributes in our annual "I Am Patient Safety" campaign. Every March, we provide recognition for individuals and groups within Pennsylvania's healthcare facilities who have demonstrated exceptional activities in support of patient safety, at the Board of Directors meeting and in the *Pennsylvania Patient Safety Advisory* (http://www.patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2016/Mar;13(1)/Pages/36.aspx). We can adopt the refreshing perspective that "to better is human."[3]

My second concern is that too few people are aware that Human Factors (HF) is a field of science that can provide insights and techniques to help us better understand our capabilities and improve our relationships with the complex systems that are integral to providing safe healthcare. HF is "the scientific discipline concerned with the understanding of interactions among humans and other elements of a system."[4] HF professionals apply "theory, principles, data, and methods to design in order to optimize human well-being and overall system performance."[4] Harnessing HF principles can help us augment human capabilities that are weak, such as providing convenient, timely decision support information rather than relying on memorizing long lists of medication dosages. Conversely, employing HF principles can help us leverage human capabilities that are unique and powerful, such as the ability to synthesize complex information from a patient's history and physical examination to develop an accurate diagnosis.

The range of HF applications in healthcare is quite broad, including both physical and cognitive capabilities and processes. The Human Factors and Ergonomics Society's website lists the varied interests of HF experts and provides insight into HF applications that can be useful in healthcare.[5] HF experts may address:

- The design of a tool or piece of equipment, so that information about correct use is provided within the design of the equipment and the risk of incorrect use is minimized; using ergonomic data and principles to improve the safety, productivity, and quality of work.[5]
- The design and impact of computer systems and other technologies, including hardware, software, applications, documentation, work activities, and work environment.[5] HF recommendations can improve the usability of electronic health records (EHRs), and contribute to improving patient safety by providing guidance about preparing and conveying information so that it can be used by human beings efficiently and effectively.[6,7]

©2016 Pennsylvania Patient Safety Authority

SELECTED RESOURCES FOR ADDITIONAL INFORMATION

Carayon P, Wood KE. Patient Safety: the role of human factors and systems engineering. Stud Health Technol Inform 2010;153:2346. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3057365/pdf/nihms274759.pdf [online; accessed 2016 May 18]

Topic 2: What is human factors and why is it important to patient safety? [online; accessed 2016 May 18]. http://www.who.int/patientsafety/education/curriculum/who_mc_topic-2.pdf

– Abstract concepts, such as situational awareness; teamwork; the effects of stress, fatigue, interruptions, and workload on performance; and human cognition and decision making, alone or in conjunction with other individuals or intelligent systems.[5,8-10]

While it is important for individual healthcare providers and healthcare teams to optimize their own knowledge and skills, their capabilities can be enhanced or constrained by the systems they interact with and work within. Diverse tools, equipment, technologies, protocols and care delivery processes, and systems are indivisibly integrated into the application of knowledge and skill in healthcare. Healthcare organizations are increasingly integrating HF expertise in patient care and research activities. Applying sound HF principles can help optimize the relationships between healthcare providers and healthcare delivery tools, technologies, and systems, for the benefit of our patients. I look forward to the day when widespread knowledge of HF principles allows us to support, utilize, and celebrate human capabilities.

NOTES

1. Institute of Medicine Committee on Quality of Health Care in America. Kohn LT, Corrigan JM, Donaldson MS, eds. To err is human: building a safer health system. Washington (DC): National Academy Press; 1999 Nov 1. 223 p. Also available: http://stills.nap.edu/books/0309068371/html/
2. Croskerry P. To err is human--and let's not forget it. *CMAJ* 2010 Mar 23;182(5):524. Also available: http://dx.doi.org/10.1503/cmaj.100270. PMID: 20231338.
3. MedStar Health National Center for Human Factors in Healthcare [website]. Washington (DC): MedStar Health; [accessed 2014 Nov 02]. Available: http://www.medicalhumanfactors.net/
4. What is ergonomics? Definition and domains of ergonomics [online]. International Ergonomics Association (IEA); 2016 [accessed 2016 Mar 27]. Available: http://www.iea.cc/whats/
5. Descriptions of all technical groups [online]. Santa Monica (CA): Human Factors and Ergonomics Society (HFES); [accessed 2016 Mar 27]. Available: https://www.hfes.org/web/TechnicalGroups/descriptions.html
6. Armijo D, McDonnell C, Werner K. Electronic health record usability: Interface design considerations. AHRQ Publication No. 09(10)-0091-2-EF. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2009 Oct. 21 p. Also available: https://healthit.ahrq.gov/sites/default/files/docs/citation/09-10-0091-2-EF.pdf
7. Lowry SZ, Quinn MT, Ramaiah M, et al. A human factors guide to enhance EHR usability of critical user interactions when supporting pediatric patient care. Gaithersburg (MD): National Insitute of Standards and Technology (NIST); 2012 Jun. 44 p. Also available: http://dx.doi.org/10.6028/NIST.IR.7865
8. IOM (Institute of Medicine). Resident duty hours: enhancing sleep, supervision, and safety. Washington (DC): The National Academies Press; 2009. 400 p. Also available: http://www.nationalacademies.org/hmd/Reports/2008/Resident-Duty-Hours-Enhancing-Sleep-Supervision-and-Safety.aspx
9. Weller J, Boyd M, Cumin D. Teams, tribes and patient safety: overcoming barriers to effective teamwork in healthcare. *Postgrad Med J* 2014 Mar;90(1061):149-54. Also available: http://dx.doi.org/10.1136/postgradmedj-2012-131168. PMID: 24398594.
10. Salas E, Cooke NJ, Rosen MA. On teams, teamwork, and team performance: discoveries and developments. *Hum Factors* 2008 Jun;50(3):540-7. PMID: 18689065.

Correction

Gardner LA, Bomboy J. Preoperative screening and the influence on cancellations and transfers: an ambulatory surgical facility collaboration. Pa Patient Saf Advis [online] 2014 Mar [cited 2016 Jun 15]. http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2014/Mar;11(1)/Pages/15.aspx

This article contained statements in error on pages 15 and 17. The statements should indicate that ambulatory surgical facility transfer rates decreased 14.7%, from 1.21 transfers per 1,000 admissions preintervention to 1.03 transfers per 1,000 admissions postintervention. Corrections have been made to the online article. The editor regrets the error.

©2016 Pennsylvania Patient Safety Authority

The Pennsylvania Patient Safety Authority's
Facebook page brings pertinent patient safety information and consumer tips right to your news feed.

Like us on Facebook

and contribute to our posts!

Scan this code with your mobile device's QR reader to access the Authority's Facebook page.

PATIENT SAFETY AUTHORITY

An independent agency of the Commonwealth of Pennsylvania

https://www.facebook.com/PennsylvaniaPatientSafetyAuthority

MS15254

PENNSYLVANIA PATIENT SAFETY ADVISORY

THE PENNSYLVANIA PATIENT SAFETY AUTHORITY AND ITS CONTRACTORS

The Pennsylvania Patient Safety Authority is an independent state agency created by Act 13 of 2002, the Medical Care Availability and Reduction of Error (MCARE) Act. Consistent with Act 13, ECRI Institute, as contractor for the Authority, is issuing this publication to advise medical facilities of immediate changes that can be instituted to reduce Serious Events and Incidents. For more information about the Pennsylvania Patient Safety Authority, see the Authority's website at http://www.patientsafetyauthority.org.

ECRI Institute, a nonprofit organization, dedicates itself to bringing the discipline of applied scientific research in healthcare to uncover the best approaches to improving patient care. As pioneers in this science for nearly 50 years, ECRI Institute marries experience and independence with the objectivity of evidence-based research. More than 5,000 healthcare organizations worldwide rely on ECRI Institute's expertise in patient safety improvement, risk and quality management, and healthcare processes, devices, procedures, and drug technology.

The Institute for Safe Medication Practices (ISMP) is an independent, nonprofit organization dedicated solely to medication error prevention and safe medication use. ISMP provides recommendations for the safe use of medications to the healthcare community, including healthcare professionals, government agencies, accrediting organizations, and consumers. ISMP's efforts are built on a nonpunitive approach and systems-based solutions.