

HIMSS[®]18

The leading health information and technology conference

WHERE **THE WORLD** CONNECTS FOR HEALTH

Conference & Exhibition | March 5–9, 2018

Las Vegas | Venetian – Palazzo – Sands Expo Center

Learning from Patient Safety Events: A Shift from Quantity to Quality

Session 103, March 7, 2018

Yang Gong, MD, PhD, UTHealth



ENERGIZED

www.himssconference.org



DISCLAIMER: The views and opinions expressed in this presentation are those of the author and do not necessarily represent official policy or position of HIMSS.



Conflict of Interest

Yang Gong, MD, PhD

Has no real or apparent conflicts of interest to report.

Agenda

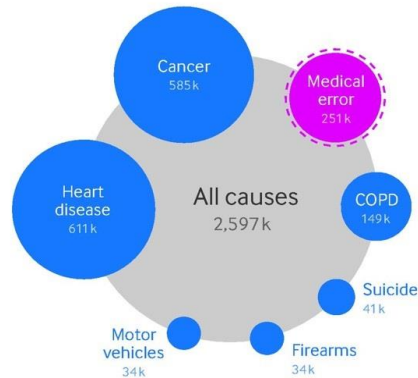
- What are patient safety events
- Challenges of reporting patient safety events
 - Quantity v.s. Quality of the reports
- The role of clinical informatics in improving patient safety
- Our approaches
- Initial results
- Discussion of future steps

Learning Objectives

1. Describe the benefits of quality event reporting for patient safety/healthcare quality improvement
2. Identify the barriers of event reporting and applicable informatics approaches for turning reports into actionable knowledge
3. Discuss how data representation and knowledge management in incident reports can facilitate quality improvement towards a better and safer healthcare system

Patient Safety: Pressures and Incentives

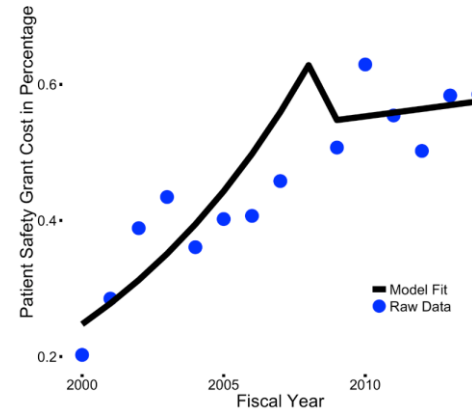
Causes of death, US, 2013



© 2016 BMJ Publishing group Ltd.
 Data source:
http://www.cdc.gov/nchs/data/nvsr/nvsr64/nvsr64_02.pdf

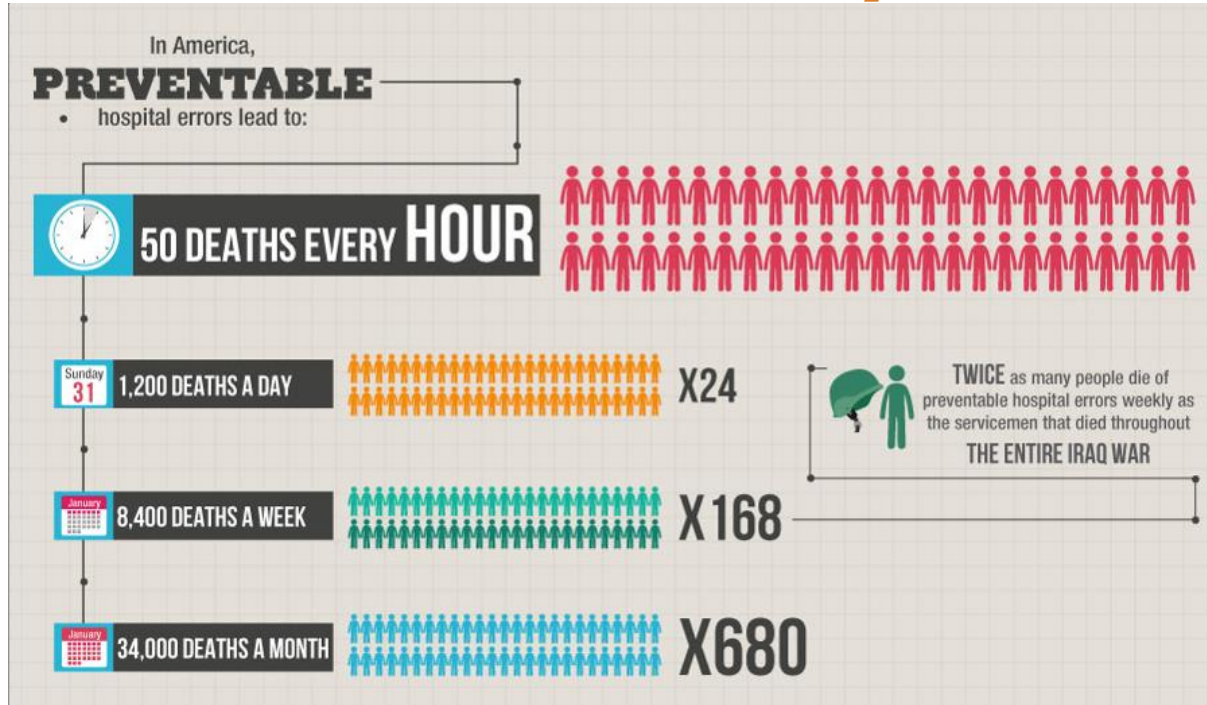
Medical error. (Makary & Daniel, 2016)

Patient Safety Grant Cost



A track of patient safety study from NIH.
 (Liang, Miao & Gong, unpublished)

Deaths due to Patient Safety Event (PSE)



Patient Safety Event Reporting

- Patient safety event (PSE) reporting
 - a mainstay of efforts to detect PSE and quality problems from the frontline practitioners
 - collected from a broad range of practitioners
 - generate a summary and feedback toward
 - actionable knowledge
 - shared learning

Patient Safety Event Reporting

- 1999 Institute of Medicine (IOM) report
 - To Err is Human
- Patient Safety and Quality Improvement Act of 2005 (PSQIA)
 - Federal privilege and confidentiality protections for PSE
 - Agency for Healthcare Research and Quality (AHRQ)
 - Patient safety organizations (PSOs)
 - Analyze near misses and incidents
 - Identify underlying factors
 - Generate actionable knowledge

Reporting Quantity and Quality

- Quantity
 - an increase in reports → an improved reporting culture
 - a reduction in reports → an indication of a safer environment
- Quality
 - underreporting
 - low quality and fragmented reports

Self-Perceived Barriers

- Voluntary reporting
 - No feedback
 - Lengthy reporting forms
 - competing with other priorities
 - Observed event seemed “trivial”
 - A trivial tip --> a large ‘iceberg’ under water



Goal

- Develop a user-centered, knowledge-based reporting and learning system
 - Help healthcare practitioners better report events
 - Connect with relevant reports
 - Learn how to address causes of errors
 - Improve the behavior at work

Our Solution

- user-centered design (UCD) and knowledge-based (KB) design
- advancing from simply counting events into a new era of understanding, trending, integrating, and resolving the events
 - a synchronous and collaborative platform
- UCD & KB features
 - improving user acceptance and satisfaction
 - promoting user engagement for
 - shared learning
 - quality underreporting

Data, User, and System

- Data consistency
 - >30% labelled under ‘other’ and “miscellaneous”
 - 66% reports created by nurses
 - 75% reports created <48 hours
 - Quality of reports is just as significant as the number of submissions

- [Gong Y.](#) Data consistency in a voluntary medical incident reporting system. J Med Syst. 2011 Aug;35(4):609-15. PubMed PMID: 20703528. Epub 2010/08/13. eng.
- [Gong Y.](#) Toward a human-centered voluntary medical incident reporting system. Stud Health Technol Inform. 2010;160(Pt 1):729-33. PubMed PMID: 20841782. Epub 2010/09/16. eng.

Data, User, and System

- Various terminologies in use
 - AHRQ Common Formats
 - Common definitions and reporting formats
- Underreporting can occur
 - Unable to identify a proper classification or definition



Data, User, and System

- Survey and interview users
 - Language difficulties on describing events & selecting terms
 - Competing priorities
- Retrospective think-aloud
 - Recall difficulties reported by inexperienced reporters
 - Prolonged completion time on questions

• [Gong Y, Song HY, Wu X, Hua L. Identifying barriers and benefits of patient safety event reporting toward user-centered design. Safety in Health. 2015, 1\(1\):7. doi:10.1186/2056-5917-1-7](#)

Structured Data Entry – 13 MCQs and four of them have narrative fields as illustrated as the part B

Predictive Text Entry

- To support reporting
 - Cueing list, auto-suggestion
- By two-group randomized test
 - Improved text generation
 - Improved data consistency and quality

C: Cueing List aids in data entry of specified single-text field (**B**) in the structured question, or comment field

Main component lists multiple-choice questions in slide-in mode

Unstructured Data Entry – One narrative comment field

Narrative data entry field equipped with text prediction functions

G: Auto-suggestion
 Suggesting the words, phrases and sentence in the context to describe the event details

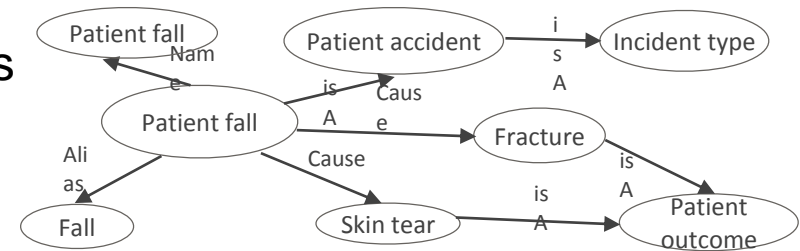
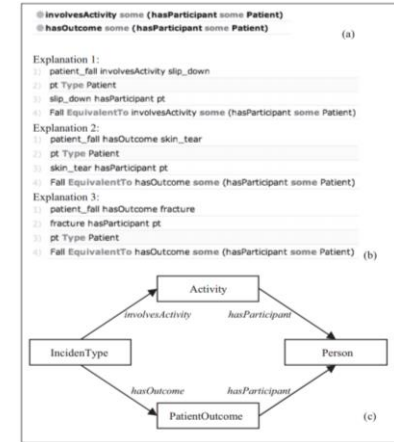
• [Gong Y, Hua L, Wang S. Leveraging user's performance in reporting patient safety events by utilizing text prediction in narrative data entry. Computer methods and programs in biomedicine. 2016 Jul;131:181-9. PubMed PMID: 27265058. Pubmed Central PMCID: PMC4899837. Epub 2016/06/07. eng.](#)

• [Hua L, Gong Y. Design of a user-centered voluntary patient safety reporting system: understanding the time and response variances by retrospective think-aloud protocols. Stud Health Technol Inform. 2013;192:729-33. PubMed PMID: 23920653. Epub 2013/08/08. eng.](#)

• [Hua L, Wang S, Gong Y. Text prediction on structured data entry in healthcare: a two-group randomized usability study measuring the prediction impact on user performance. Appl Clin Inform. 2014;5\(1\):249-63. PubMed PMID: 24734137. Pubmed Central PMCID: PMC3974259. Epub 2014/04/16. eng.](#)

Managing PSE Knowledge

- Ontology
 - Interoperability among
 - home-grown systems
 - patient safety organization (PSO) systems
 - Data integration
 - organizing prevailing classifications
 - Decision making

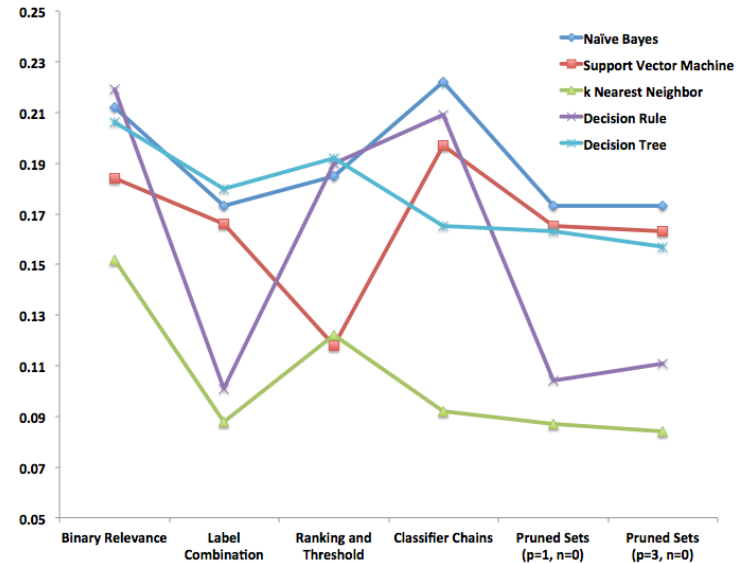


- Liang C, Gong Y. On building an ontological knowledge base for managing patient safety events. Stud Health Technol Inform. 2015;216:202-6. PubMed PMID: 26262039.
- Liang C, & Gong Y. Knowledge Representation in Patient Safety Reporting: An Ontological Approach. Journal of Data and Information Science. 2016 1(2): 75-91. DOI: 10.20309/jdis.201615

Classifying PSE Reports

- Identify multiple categories -- term frequency
 - Reveal details of complex cases
 - Reduce manual review workload
 - Detect systems failure

F Measure for Different Combinations of Algorithms



- Liang C, Gong Y. Predicting Harm Scores from Patient Safety Event Reports. Stud Health Technol Inform. 2017

Knowledge Support

- Identify similar cases based on query
 - Web M&M (PSNet)
 - Patient Safety Organization (PSO) data
 - Data from home-grown system
- Provide solution and suggestion

Prototype

Home Search Report Contact

Query Case:
Ebola: Are We Ready?

Click any case on the right, its annotations will be shown below.

Safety Target

- Medical Complications
- Nonsurgical Procedural Complications
 - Bedside Procedures

Approach to Improving Safety

- Quality Improvement Strategies
 - Practice Guidelines

Clinical Area

- Allied Health Services
- Medicine
 - Pediatrics
- Nursing

Target Audience

- Health Care Providers
 - Allied Health Professionals
 - Physicians
 - Nurses

Setting of Care

- Hospitals

SIMILAR CASES (72) were sorted by similarity scores (high to low)

Too Hot For Comfort
 December 2007. By Heather Cleland, MBBS; Jason Wasiak, BV, MPH

Bloody BP Cuff
 May 2003. By Anil K. Madan, MD

No BP During NIBP
 September 2014. By Matthias Gorges, PhD, and J. Mark Ansermino, MBECh, MSc

Too Much, Too Fast
 September 2014. By Delphine Tuot, MDCM, MAS

Benefits vs. Risks of Intraosseous Vascular Access
 July/August 2014. By Raymond L. Fowler, MD, and Melanie J. Lippmann, MD

Liver Biopsy. Proceed With Caution
 July/August 2014. By Don C. Rockey, MD

Outbreak
 May 2011. By Richard Rothman, MD, PhD; Sahael Stephens, MD

Where's the Feeding Tube?
 September 2008. By Norma A. Metheny, RN, PhD; Kathleen L. Meert, MD

Central Line Clot
 May 2003. By Adrienne G. Randolph, MD, MSE

Compare and Contrast
 April 2003. By Kerry C. Cho, MD; Glenn M. Chertow, MD, MPH

<< < > >> Page 1 of 8

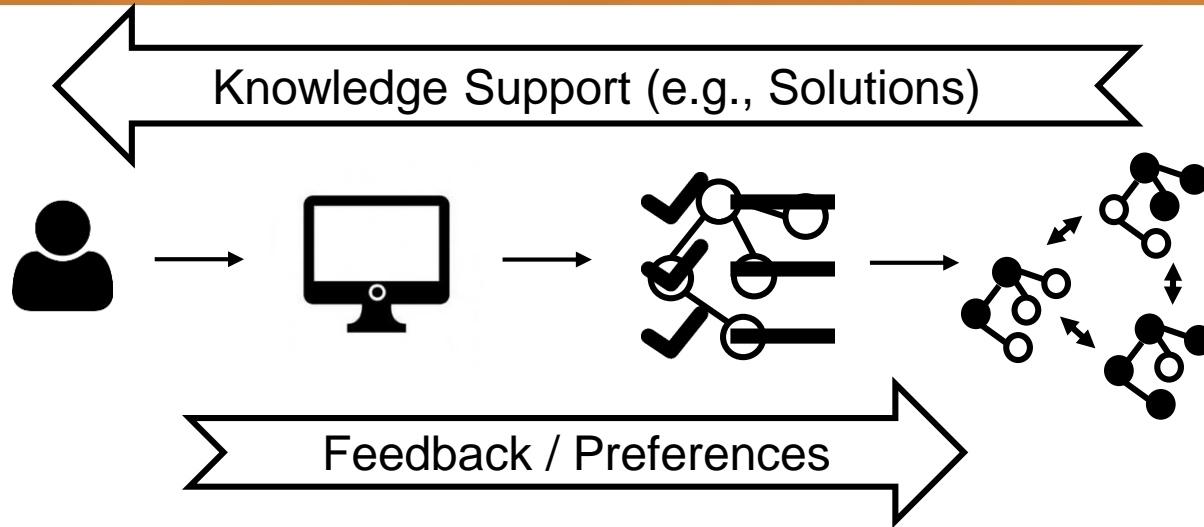
The query case

Similar cases ranked by similarity scores

Users' feedback

Annotations

- Kang H, Gong Y. Design of a User-Centered Voluntary Reporting System for Patient Safety Events. Stud Health Technol Inform. 2017



Current Frames

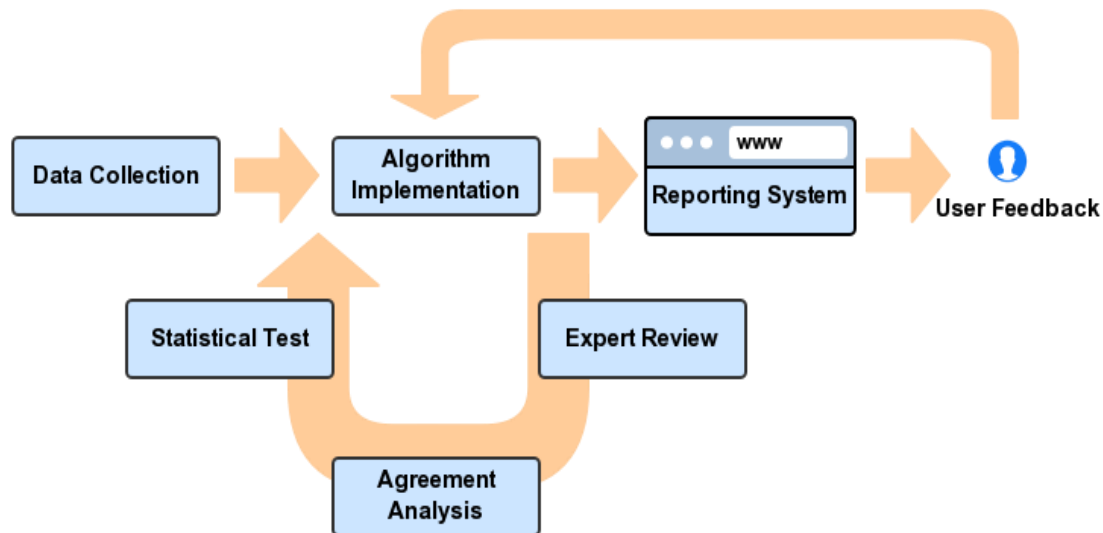
- Reports are stored entry by entry
- Reporters learn nothing
- No feedback for systems

Proposed Frames

- Reports are annotated on the same feature tree
- Provide solutions for reporters
- The system can learn from user feedback and preferences

A New Workflow

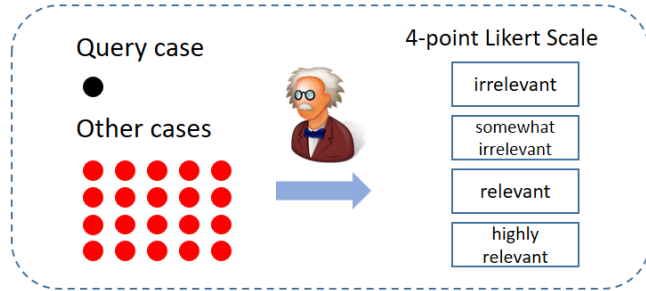
- To improve data quality of PSE reporting system
 - Seven key modules:



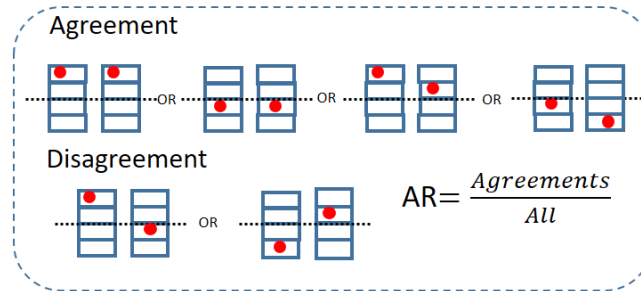
- Kang H, Gong Y. A Novel Schema to Enhance Data Quality of Patient Safety Event Reports. AMIA Annu Symp Proc. 2017 Feb 10;2016:1840-1849. eCollection 2016. PubMed PMID: 28269943; PubMed Central PMCID: PMC5333227.
- Zhou S, Kang H, Gong Y. Toward Learning from Patient Fall Events Based on Kirkpatrick Model. Stud Health Technol Inform. 2017

Identifying Relevant Cases

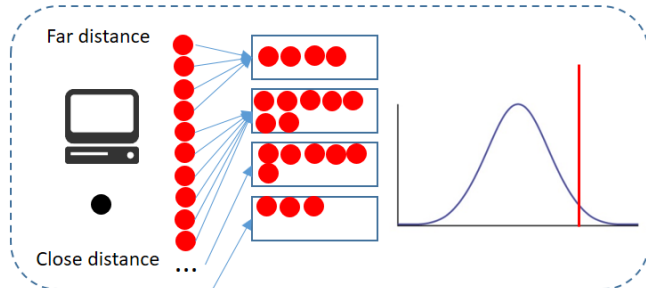
1. Individual Review



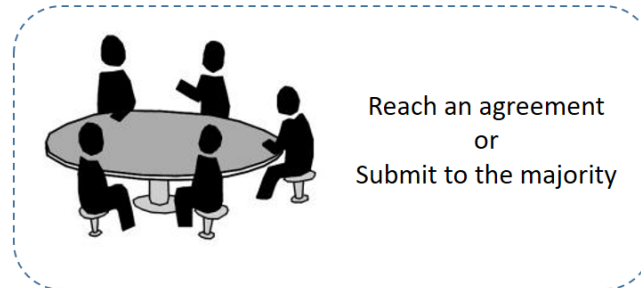
2. Calculate Agreement Ratio Among Experts



4. Evaluate the Distance Measurement



3. Group Discussion



• Liang C, Gong Y. Automated Classification of Multi-labeled Patient Safety Reports: A Shift from Quantity to Quality Measure. Stud Health Technol Inform. 2017

Providing Targeted Solutions



Home Search Report Contact

Query Case:

ID: 399, Subtype: Patient Fall

Q1: Was the fall unassisted or assisted?
 a. Unassisted
 b. No

Q2: Was the fall observed?
 b. No

Q3: Who observed the fall?
 N/A

Q4: Did the patient sustain a physical injury as a result of the fall?
 b. No

Q5: What type of injury was sustained?
 N/A

Q6: Prior to the fall, what was the patient doing or trying to do?
 b. Ambulating with assistance and/or with an assistive device or medical equipment

Q7: Prior to the fall, was a fall risk assessment documented?
 b. No

Q8: Was the patient determined to be at increased risk for a fall?
 N/A

Q9: At the time of the fall, were any of the following risk factors present?
 c. Sensory impairment (vision, hearing, balance, etc.)

Q10: Which of the following were in place and being used to prevent falls for this patient?
 d. Call light/personal items within reach

Q11: At time of the fall, was the patient on medication known to increase the risk of fall?
 c. Unknown

Q12: Was the medication considered to have contributed to the fall?
 N/A

Q13: Did restraints, bedrails, or other physical device contribute to the fall (includes tripping over device electrical power cords)?
 b. No

SIMILAR CASES **SOLUTIONS**

Specific Solution

- Re-evaluate type
- Provide training
- Identify and manage associated info
- Carefully assess
- Deploy use
- Provide

General Solution

Event Reporting

- Have guideline
- Use of a standardized environment

Education

- Address the risk
- Educate patients to prevent falls
- Educate and investigate

Patient Monitor

- Deploy hourly

Risk Assessment

- Deploy routine falls with injury
- Reassess fall
- Periodic facility
- Modify environment

Communication

- Communicate
- Communicate
- Display falls risk

Assistive Devices

- Ensure the weight-bearing
- Require patients wear

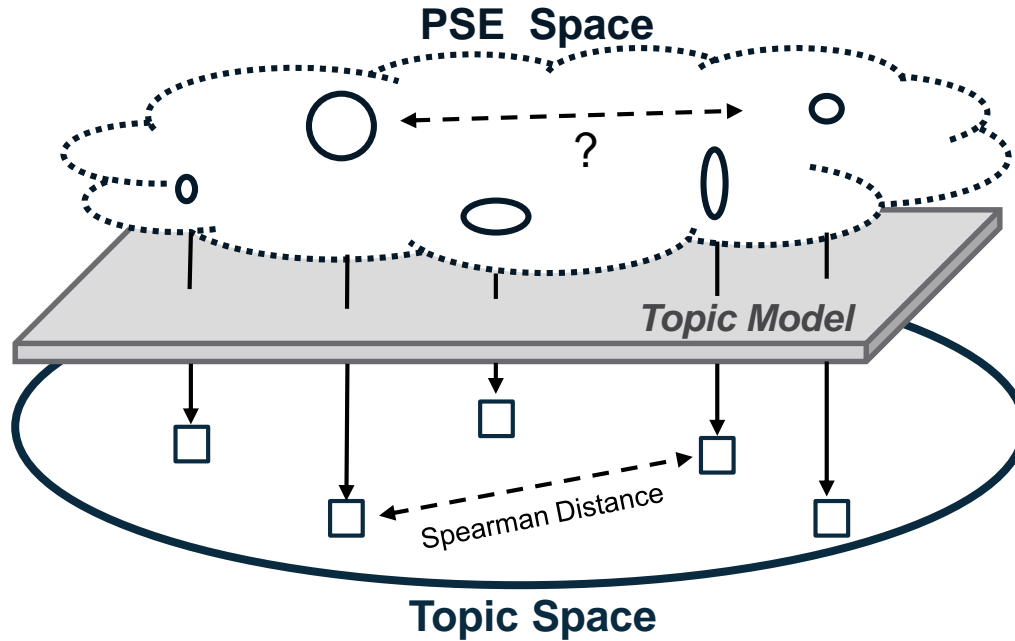
Q6. Prior to the fall, what was the patient doing or trying to do?

Answer: *b. Ambulating with assistance and/or with an assistive device or medical equipment.*

Specific Solutions

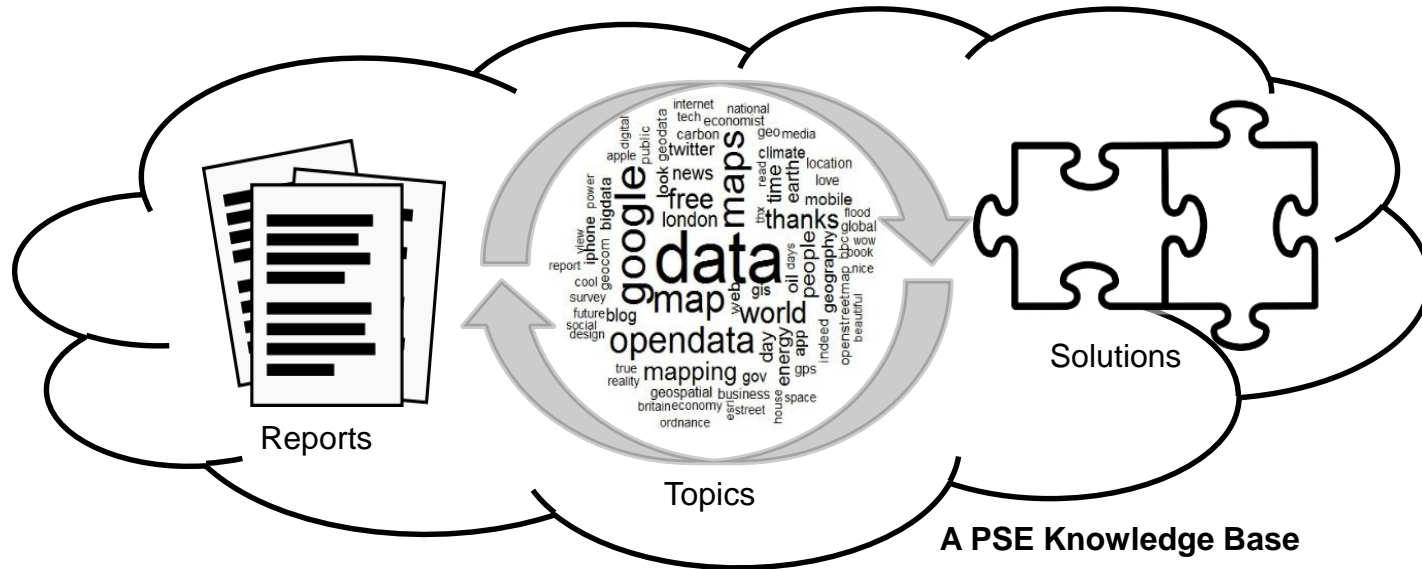
- Re-evaluate types of assistive devices used by the facility to prevent falls.
- Provide training to staff on the use and maintenance of assistive devices.

Exploring Event Connections



- Liang C, Gong Y. Enhancing Patient Safety Event Reporting by K-nearest Neighbor Classifier. Stud Health Technol Inform. 2015;218:93-9. PubMed PMID: 26262533.

Developing a PSE Knowledge Base



- Kang H, [Gong Y](#). Developing a similarity searching module for patient safety event reporting system using semantic similarity measures. BMC Med Inform Decis Mak. 2017 Jul 5;17(Suppl 2):75. doi: 10.1186/s12911-017-0467-8. PubMed PMID: 28699567; PubMed Central PMCID: PMC5506579.
- Yao B, Kang H, Miao Q, Zhou S, Liang C, [Gong Y](#). Leveraging Event Reporting through Knowledge Support: A Knowledge-based Approach to Promoting Patient Fall Prevention. Stud Health Technol Inform. 2017

Acknowledgement



- **Funding**

- Agency for Healthcare Research & Quality, 1R01HS022895
- UTHealth Innovation in Cancer Prevention Research Training Program (Cancer Prevention and Research Institute of Texas grant RP#160015)
- University of Texas System Grants Program #156374

- **Current lab members**

- Hong Kang, PhD
- Ju Wang, PhD
- Sicheng Zhou, BS
- Bin Yao, MD

- **Alumni**

Chen Liang, MS, PhD
Lei Hua, PhD
James Richardson, MS
Zhijian Luan, MS
Yanyan Shen, MHA
Rajitha Gopidi, MHA

Dan Wang, PhD
Mathew Koelling, MHA
Hsing-yi Song, MD, MS
Xinshuo Wu, MD, MS
Swananda Pandit, MS
Qi Miao, BS

- **Collaborators**

Jing Wang, PhD, RN
Nnaemeka Okafor, MD, MS
Hua Xu, PhD
Tina Hilmas RN, BSN
Becky Miller MHA
Amy Vogelsmeier, PhD, RN

- **CPRIT Summer intern**

Cindy Songting Wu
Frank Wang
Aliza Ali

Questions

- Dr. Yang Gong
 - gongyang@gmail.com (LinkedIn)
- Complete online session evaluation