Analysis of Communication in the Electronic Medical Record: Communication of the Patient Story across the Continuum of Care

Kaying Vang*

Supervisor of Clinical Documentation Improvement, Clovis, CA 93619, USA.

Abstract

The electronic health record (EHR) and problem list are tools used to communicate the patient's medical story. The increase adoption of the EHR has been recognized to improve the quality and efficiency of patient care. However, emerging reports of unrecognized implications have been found to be associated with EHR implementation and its functionality. These implications have been found to affect the quality, safety, and efficiency of patient care. The primary purpose of this project was to retrospectively assess the electronically written communication by following the EHR problem list as the patient progresses through each level of care during an inpatient stay starting in the Intensive care unit (ICU). The secondary purpose of the project was to identify potential EHR tools that may improve the utilization and maintenance of the problem list. The electronic problem list functions as the communication tool that tells the patient story, therefore it is essential that the story it tells is accurate. The findings from this study indicated that the utilization and maintenance of the problem list in which it is accurate and complete may result in care that is of quality, safe and efficient.

Keywords: Electronic health record (EHR) · Updated problem list · EHR tools

Introduction

Healthcare today is faced with a magnitude of pressure to provide safe, quality, and efficient care. Landmark studies such as the Institute of Medicine report titled "To error is human" and "Crossing the Quality Chasm: A New Health System for the 21st Century" both identified communication failures as one area of focus that needs to be improved to meet national goals for having quality, safe and effective care [1]. The studies found in these two reports, were astounding since it signified that in this day in age, quality of healthcare is not where it ought to be. A major attempt by the federal government to address these concerns led to the introduction of the electronic health record which emerged as an initiative of the Health Information Technology for Economic and Clinical Health (HITECH) Act passed by Congress in 2009 [2].

The government initiatives supported the implementation of the electronic health record with the notions of improving healthcare for individuals through quality and safe care with recommended safeguards provided for healthcare facilities when employing EHR. Since the adoption of the EHR there have been various reports indicating harmful events found after the implementation of the EHR. The increasing adverse events were associated with poor system usability, inappropriate documentation capture and information integrity [3].

Communication in the Continuum of Care

Communication and coordination of care is identified as one of the quality initiatives endorsed by CMS, Agency for Healthcare Research and Quality's (AHRQ) and National Quality Forum [4]. In healthcare, the communication among healthcare providers should be accurate and complete to ensure effective messaging about a patient when making care decisions. A patient encounters a very complex health systems, in various settings with multiple providers. In the EHR, the patient's encounter with each provider in conjunction with that provider's evaluation and treatment plan should accurately depict the patient story. The communication about a patient's current, past, and

other significant history should be accurate and transparent across the care continuum. Having a strong communication about a patient will serve as the foundation for effective communication during transition of care. It is recognized by many health entities that there are safety and quality concerns surrounding ineffective communication especially during transition and coordination of care. The initiative to improve communication while caring for patients during these phases of care have been stated in several initiative implemented by The Joint Commission to reduce harm and increase safety during patient care.

Problem List

The problem list functions as a communication vehicle that includes the documentation of a patients current, past as well as other significant medical history. Healthcare providers have long used the problem list to make care decisions and as a communication tool of a patient's story. The implementation of the EHR, has led to a problem list that lies in the EHR but not readily visible for review or use and has remained without real guidance for providers. Thus, the problem list has lost its original function as the communicator of the patient's medical story. Despite the known benefits of using the problem list, there continues to be widespread debate about what should be listed on the problem list, who should manage the problem list as well a lack of policies directing the standardization of the problem list. The results of these recognized problems led to what we see today as an incomplete, inaccurate, and ineffective communication tool that has been recognized to affect the quality, safety, and efficiency of care.

Setting

The study was conducted in a 300 bed mid-sized not-for-profit acute care hospital located in the central area of California with population size of 3.8 million people. The hospital has adopted EPIC EHR system and offers healthcare providers the ability to document on templated progress notes with the option to free-text, problem-based charting (PBC) progress notes or through dictation resulting in transcribed progress notes. The current system allows providers to document using problem-based charting through the EHR problem list management tool. Other progress notes options used to document care is done with simple SOAP note templates or via dictation [5].

Purpose

The primary purpose of this project was to retrospectively assess the electronically written communication of the patient's medical problems by following the EHR problem list as the patient progresses through each level of care during an inpatient stay starting in the Intensive care unit (ICU) looking at

***Address for Correspondence**: Kaying Vang, Supervisor of Clinical Documentation Improvement, 1912 N Graybark Ave., Clovis, CA 93619, USA. E-mail: herkvang@gmail.com*

the accuracy of the problem list and using the final billed list of diagnoses as a comparison and representation of accuracy. The secondary purpose of the project was to identify potential EHR tools that may improve the utilization and maintenance of the problem list [6].

Methodology

After receiving approval through the hospital administration and IRB, the study was implemented using the extracted data provided by the hospital's data services team using the data collection tool as a guide for selection of the study population (Appendix A). This study was completed through retrospective chart review looking at obfuscated data to assess the problem list and potential EHR tools that may assist in the increase usage and maintenance of the problem list.

Study Population

This study utilized a sample size of 200 hospital accounts in which the insurance carrier utilizes MS-DRGs payment system and were admitted to the ICU from December 1, 2018 to December 31, 2019. The sample will be split between 100 random hospital records obtained from December 1, 2018 to April 30, 2019 and 100 random records after May 1, 2019 to December 31, 2019. Excluded accounts will include those accounts where the chief complaint is not documented discretely, patients under the age of 18 years old and those with any pregnancy related MS-DRG. Using the data collection tool and above defined criteria, the actual data resulted in 144 cases belonging to ICU Group A and 56 cases belonging to ICU Group B.

Data Collection

The data was extracted by the hospital's data services team and provided as obfuscated data. The data was collected using the Data Collection Tool as a guide to ensure validity and reliability. The same Data Collection Tool was used to evaluate and code the data and inputted into SPSS for analysis (Appendix A)

Data Analysis

During the analysis, a comparison between ICU Group A (did not utilize problem list or problem-based charting) and ICU Group B (utilize problem list and problem-based charting) during the time period of December 1, 2018 to December 31, 2019 was evaluated for problem list update. The number of problems on the problem list was counted and compared to the number of diagnosed counted on the final billed diagnoses and later compared to the type of ICU Consult/H&P note type, Hospitalist note type and Discharge summary note type. The data variables for updated problem list, ICU groups A & B, ALOS, GMLOS, problem list diagnosis count for each medical record case and final billed diagnoses count for each medical record case was further analyzed using these statistical tests: Frequency, Pearson Correlation, Chi-square, and Cross-tabulation.

Results

The frequency of problem list update was compared between ICU Group A and Group B (Table - 1)

Relationship between Problem List Update and ICU provider Consult/H&P note type

To obtain a greater understanding if the ICU provider note type played a significant role in an updated problem list, the ICU provider Consult/H&P note types were first evaluated for frequency of note types. As demonstrated in (Table - 2) the most common type of ICU Consult/H&P note type used 38.5% of EHR smart tools known as Smart phrases. The next commonly used note type was Free text at 19% follow by Smart link at 15%.

Note: This table show the different types of progress notes used for ICU Consult/H&P

To classify what progress note types were used among ICU Group A and Group B that was associated with an updated and non-updated problem list,

the Cross tabulation test was performed. The results are demonstrated in (Figure - 1) and Figure 1.2. The results for ICU Group A indicated that the template progress note type with Smart phrases had the highest percentage of usage associated with an updated Problem List at 47%, followed by 22% Free text progress notes. Figure 1.1 also showed that approximately 22% of a non-updated Problem List was associated with the templated progress note containing Smart phrases. It was noted that 9% of non-updated medical record cases had an unidentified note type.

(Figure - 2) showed that ICU Group B had a greater number of Template note type with Smart links at 18% that was associated with an updated Problem List after the patient was transferred out of the ICU; followed by 13% transcription notes; and 9% free text. ICU Group B with a non- updated Problem List was noted to have 2% of transcription notes, 1% Template Smart phrases, and 1% Smart Links.

In trying to understand if there was an association between the ICU Consult/H&P note type that may assist with problem list update, a cross tabulation test was completed. The crosstabulation resulted in these findings: (1) updated Problem List after ICU (mean =1.25; Std deviation =.434); (2) ICU Consult/H&P Note type (mean =4.24; Std deviation =2.313; r = .105; p-value =.139). A significant statistical relationship among two variables were found if the p- value, two-tailed was ≤ 0.05. The results indicated no association between an updated Problem List and ICU Consult/H&P note type. This comparison group was found to have a p-value, two- tailed > 0.05 as described above.

(Table - 3) shows the details of the Cross tabulation with Chi-square test of independence, which indicated that there was not a statistical significance with p-value, 2-sided Asymptotic Significance > 0.05 for both ICU Group A and Group B (p-value, 2-sided Asymptotic significance =.311 and .644 respectively).

Relationship between Problem list update and Hospitalist Note Type

Statistical results did not find an association between an updated Problem List and the ICU Consult/H&P note type. The next step was to follow the problem list as the patient was transferred out of the ICU and onto the hospital ward. The first hospitalist note type after the ICU transfer was used to analyze this relationship. The test resulted in these findings: Hospitalist Note type (mean =3.07; Std deviation =2.173; r = -.156; p-value, two-tailed =.967). The results indicated no association between an updated Problem List and Hospitalist note type.

Relationship between Discharge Summary Note type and Problem List Update

The Pearson Correlation test was completed which indicated a low correlation between an updated Problem List and the Discharge Summary note type (Table - 4). Additional analysis was completed to further evaluate the statistical relationship between an updated Problem List and Discharge Summary note type using Cross tabulation and Chi-square test as reflected in (Table - 5). The 2-sided Asymptotic significance indicated that a relationship exists between an updated Problem List and Discharge Summary note type.

Recognizing that an updated problem list and the discharge summary note type have a significant association, it was important to identify what discharge summary note type may contribute to an updated problem list. To distinguish which Discharge Summary note type is associated with an updated Problem List, the frequency of note type for the Discharge summary was applied. (Figure - 3) shows that providers were more likely to use Template notes with EHR Smart link followed by Smart phrases, and Free text.

## Other Relationship between Problem List Update after ICU

Further statistical testing was computed using Pearson Correlation test to identify if updating the Problem list was associated with other variables such as (1) number of diagnoses listed on the problem list, (2) GMLOS (mean =6.734; Std deviation =4.0253; r = -.008; p-value, two-tailed = .907) and (3)
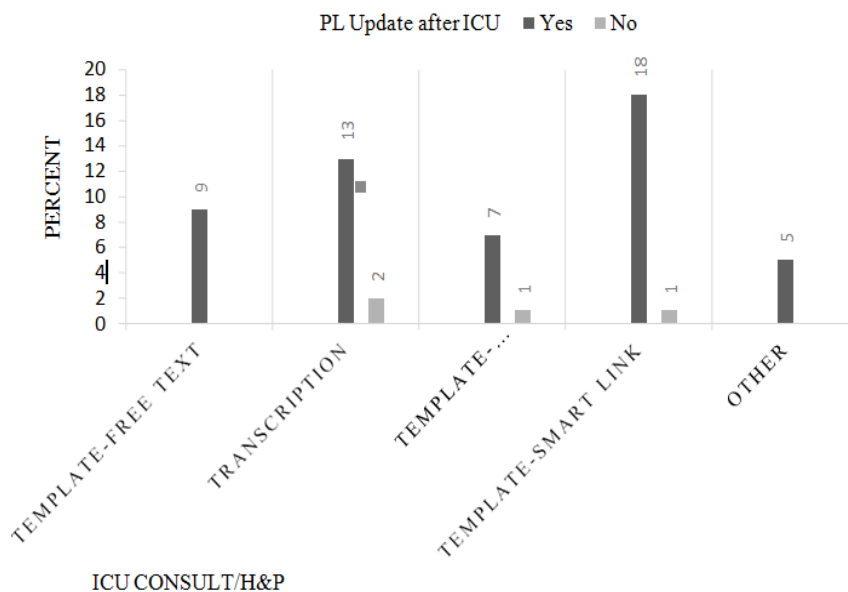
Table 1: ICU Group Problem list update after ICU.

	Yes	Percent	No	Percent	Total
ICU Group A	98	68.10	46	32	144
ICU Group B	52	92.90	4	0.70	56
Total					200

Table 2: Frequency of ICU Consult/H&P Note Type.

Note Type	Frequency	Percent
Template-Free text	38	19
Transcription	26	13.0
Template-Smart	77	38.5
Phrase		
Template-Smart Link	30	15.0
Template-Smart Text	8	4.0
Template-Voice	1	.5
Recognition		
Other-Unknown	20	10.0
Total	200	100.0
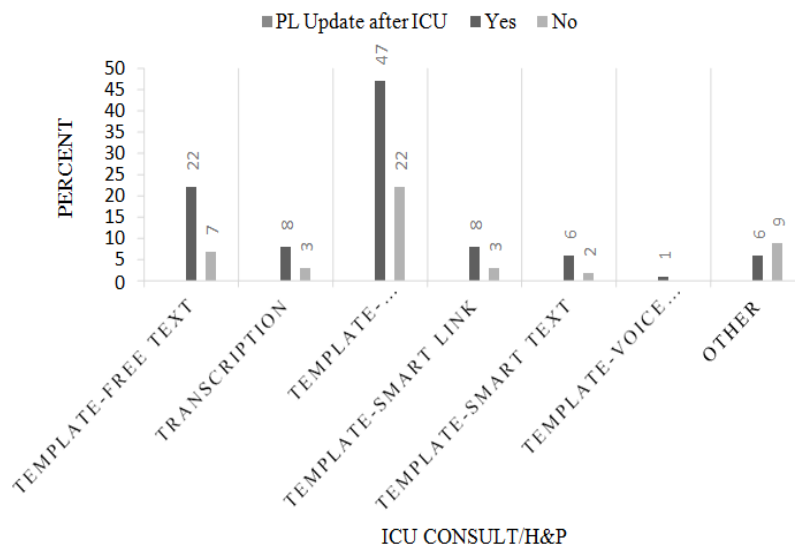
Figure 1. ICU Group A Note Type compared with Problem List update after transfer.

Figure 2. ICU Group B compared with Problem List update after transfer.

Table 3: Association between ICU Group A and Group B Problem list update Chi-Square Tests.

ICU Group		Value	df	Asymptotic Significance (2-sided)
A	Pearson Chi-Square	7.112[b]	6	.311
	Likelihood Ratio	7.006	6	.320
	Linear-by-Linear Association	3.507	1	.061
	N of Valid Cases	144		
B	Pearson Chi-Square	2.391[c]	4	.664
	Likelihood Ratio	3.176	4	.529
	Linear-by-Linear Association	.115	1	.734
	N of Valid Cases	56		
Total	Pearson Chi-Square	9.091[a]	6	.169
	Likelihood Ratio	9.184	6	.163
	Linear-by-Linear Association	2.198	1	.138
	N of Valid Cases	200		

a. 3 cells (21.4%) have expected count less than 5. The minimum expected count is .25.
b. 6 cells (42.9%) have expected count less than 5. The minimum expected count is .32.
c. 6 cells (60.0%) have expected count less than 5. The minimum expected count is .36.

Table 4: Association between Problem List update and Discharge Summary.

		PL Update after ICU	Discharge Summary Note Type
PL Update after ICU	Pearson Correlation	1	-.156*
	Sig. (2-tailed)		.028
	N	200	200
Discharge Summary	Pearson Correlation	-.156*	1
	Sig. (2-tailed)	.028	
	N	200	200

* Correlation is significant at the 0.05 level (2-tailed).

Table 5: Correlation between Problem Update and Discharge Summary Note Type.

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	30.036[a]	6	.000
Likelihood Ratio	31.827	6	.000
Linear-by-Linear Association	4.836	1	.28
N of Valid Cases	200		
a. 7 cells (50.0%) have expected count less than 5. The minimum expected count is .25.			

ALOS (mean =13.68; Std deviation =15.933; r = -.207; p-value, two-tailed =.003). The results demonstrate no significant relationship between updated Problem List and GMLOS (r = -.008, p-value, two-tailed =.907). A moderate association was found between an updated Problem List and number of diagnoses on the Problem List (mean =7.66; Std. deviation =4.921; r = -.496; p-value, two-tailed = .000) and a low negative correlation was statistically significant between an updated Problem List after ICU and ALOS and strong correlation between GMLOS and ALOS (r =.619, p-value, two-tailed = .000).

Relationship between Problem List number of diagnoses and Final billed diagnoses

To answer the research questions hypothesized for this study, the mean and frequency of diagnoses listed on the problem list and on the final billed diagnoses were analyzed. A relationship between the Problem List and Final diagnosis list was computed with Pearson Correlation test. The Frequency test shows the number of diagnoses listed on the Problem List with a mean =7.66 and Std. deviation = 4.921 with variance of 24.217 compared to the number of diagnoses listed on the final billed with mean = 17.3350 and Std. deviation = 3.96882 with variance of 15.752. (Table - 6) demonstrates the mean number of diagnoses listed on the Final billed list of diagnoses when compared to the number of diagnoses found on the Problem list.

The Pearson Correlation test looking at the association between the Problem List number of diagnoses and the Final list of diagnoses indicated a moderate relationship with r = .385 and p- value, two-tailed = .000. The Pearson Correlation test was also computed to assess the relationship between Problem list number (mean 7.66; Std. deviation 4.921) and GMLOS (mean=6.734; Std deviation =4.0253). The results showed r =.243 between Problem List number and GMLOS with p-value, two-tailed of 0.001 indicating a low relationship.

Note: The number of diagnoses on the Problem List was compared to the number of diagnoses on the Final billed lists. The lower the number of diagnoses noted on the Problem List the greater the variance between the two comparison. When more diagnoses were found on the Problem List the variance between the two variables were lower.

Table 6: Comparison of Number of diagnoses on Problem List and Final billed list.

Problem List	Mean	N	Std. Deviation
0 diagnosis on PL	16.3810	21	5.06435
1 diagnosis on PL	16.0000	8	5.20988
2 diagnosis on PL	14.2000	5	6.41872
3 diagnosis on PL	16.7143	7	5.25085
4 diagnosis on PL	13.6667	12	3.49892
5 diagnosis on PL	15.4286	14	4.27361
6 diagnosis on PL	16.2381	21	4.06085
7 diagnosis on PL	15.7333	15	4.66701
8 diagnosis on PL	18.0000	13	3.16228
9 diagnosis on PL	17.6154	13	3.57161
10 diagnosis on PL	19.0714	14	1.73046
11 diagnosis on PL	20.0000	13	0.00000
12 diagnosis on PL	18.8333	12	1.89896
13 diagnosis on PL	19.8889	9	0.33333
14 diagnosis on PL	20.0000	4	0.00000
15 diagnosis on PL	19.3333	6	1.63299
16 diagnosis on PL	20.0000	4	0.00000
17 diagnosis on PL	20.0000	2	0.00000
18 diagnosis on PL	20.0000	3	0.00000
20 diagnosis on PL	19.7500	4	0.50000
Total	17.3350	200	3.96882

Conclusion

Having a complete and accurate problem list serves as a vehicle for communication about the patient's story. The completeness of problem list is central to ensuring quality, safe and effective care. It only becomes a valuable tool if managed appropriately, therefore stakeholder involvement is needed to guide the usage of the problem list and provide standardization to the process. The findings from this study suggested that there are EHR tools that can assist in the use and maintenance of the problem list as well as a relationship that exists among an accurate and complete problem list and quality and efficient care. This study hopes that these findings serve a purpose to increase the use of the problem list and the recognition that this tool can be utilized to accomplish IOM goal of high quality of care for all by communicating an accurate patient story.

Appendix A

Record selection Criteria

- Any patient seen in the ICU department (type of progress notes used identified: free text, Smart phrase, Smart text, PBC, transcription, voice recognition, Smart link, Template Copy-forward)

- Discharge date range: 12/01/2018 to 12/31/2019

- Only accounts where the primary DRG is an MS-DRG

- Only encounters where the Chief complaint is documented discreetly

- Only pull 100 random charts for each CY, 2018 and 2019

Data Collection Tool Variables

- Primary MS-DRG (Medicare Severity Diagnosis Related Groups)

- Hospital Account Record ID (obfuscated by data services prior to sending extracted data to PI)

- GMLOS (Geometric Length of Stay)

   o   This is attached to the MS-DRG. This is already in Epic.

- Actual length of stay

   o   First ADT IP Event to the Discharge Date. Days with a decimal point.

- Chief complaint (reason for admission or evaluation) [From ED]

- Principal diagnosis (admission diagnosis as documented in physician admission order)

   o   ICD Code Name and ICD Code itself

- ICU Group A Physician (12/01/2018 to 04/30/2019) Yes/No

   o   Based on discharge date

- ICU Group B Physician (5/01/2019 to 12/31/2019) Yes/No

   o   Based on discharge date

- Template Note Y/N

   o   Provider use a template note during the hospital encounter, note type = H&P or Consult note types. Only where note was created post the first ICU ADT event.

- Template notes creation Date Time

- Dictation Note Y/N

   o   This one is maybe for the discrete field. Entire encounter.

- Problem List Y/N

   o   Did the problem list get updated post the first ICU ADT event.

- Problem list diagnosis /ICD code first 20 (during the encounter)

- First ADT Event Date Time post leaving the ICU

- First ADT Event Department Name post leaving the ICU

- Date Time first hospitalist note post the first ICU ADT encounter event.

- Template Note Y/N

   o   Provider use a template note during the hospital encounter, note type = H&P or Consult note types. Only where note was created post the first ICU ADT event.

- Template notes creation Date Time

   o   Initial Hospitalist Progress Note post ICU ADT event

- Problem List Y/N

- o   Did the problem list get updated post the first ICU ADT event?

- o   Problem list update date time first 20 diagnoses/ICD code (during the encounter)

- Discharge Summary/Note Template use Y/N

- o   Template notes creation Date Time

- Problem List Updated Date/Time (at time of discharge)

- o   Problem list date/ diagnosis ICD code first 20 (during encounter)

- Medical History Name

- Medical History Date

- Account ICD Code Name (top 20)

Account ICD Code (top 20).

References

1. Institute of Medicine. Crossing the Quality Chasm: A New Health System for the 21st Century. Washington, DC: The National Academies Press. (2001).

2. Colicchio, Tiago K., James J. Cimino, and Guilherme Del Fiol. "Unintended consequences of nationwide electronic health record adoption: challenges and opportunities in the post-meaningful use era." *Journal of medical Internet research*. (2019); 21(6):13313.

3. Bowman, Sue. "Impact of electronic health record systems on information integrity: quality and safety implications." *Perspectives in health information management*. (2013); 10: 1-19.

4. CMS. What's the CMS quality strategy. CMS.gov Centers for Medicare and Medicaid Services. (2019).

5. Holmes, Casey. "The problem list beyond meaningful use: part I: the problems with problem lists." *Journal of AHIMA*. (2011); 82(2): 30-33.

6. The Joint Commission. Inadequate hand-off communication. Sentinel Event Alert. (2017).