

FMSRE Results Presentation

Big Bad Data

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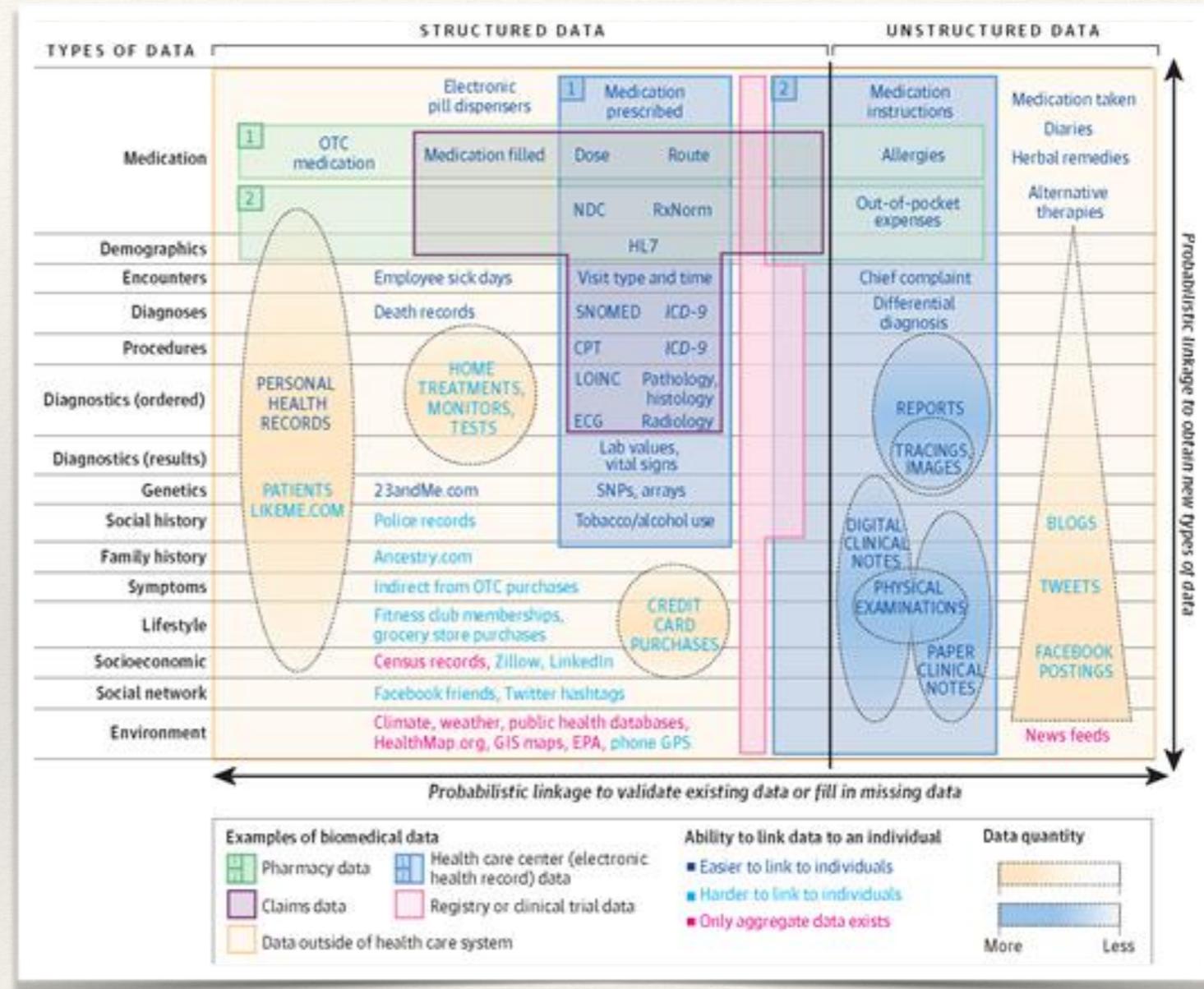
Special thanks to the Department of Family and Preventive Medicine and
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Project Overview

- ❖ Literature search
 - Learning about the problem list and big data
- ❖ Chart review
 - Auditing for errors and other significant findings
- ❖ Survey
 - To understand the issues discovered during the chart review
- ❖ Data analysis
 - Making inferences from the findings

Big Data

- ❖ Big data scientist hope to study most aspects of a patient's life
 - Example: relationships between grocery shopping and diabetes or Facebook friends and compliance with medical treatments¹
- ❖ Temporal associations
 - Example: relationship between the introduction of viox and the frequency of ischemic heart disease³
- ❖ Caution is needed



History of The Problem List

- ❖ Dr. Lawrence Weed and the POMR

- ❖ 1968 paper on the subject entitled “Medical Records that Guide and Teach”¹⁵
- ❖ The problem list is a key component of the POMR
- ❖ Described by Weed as a “table of contents” and an “index” combined.¹³
- ❖ He believed the problem list should:¹³

“list all the patient’s problems, past as well as present, social and psychiatric as well as medical.”

- Be in the front of the patient’s chart
- Defined as precisely as possible including the etiology or principal manifestations
- Modified (no erasing) as the problem changes or becomes more clear
- Always be dated and complete
- Temporary problems should not be added to the “master list”
- When time is limited a list titled “problems not yet completely delineated” should be used

History of the Problem List

- ❖ Other definitions
 - Anything the patient or provider perceives as a health threat¹⁶
 - Active and past diagnoses relevant to the current care of the patient¹⁷
- ❖ Modern problem lists must also use standardized nomenclature (ICD-9-CM or SNOMED CT)⁹

Problems With the Problem List

- ❖ Early proponents of the POMR recognized that errors are made in formulating a complete problem list¹⁴
- ❖ Recent research suggests the problem list does contain inaccurate or outdated information⁶
- ❖ There may also be disagreement among clinicians about what should be included and who should contribute to the problem list^{12, 8}

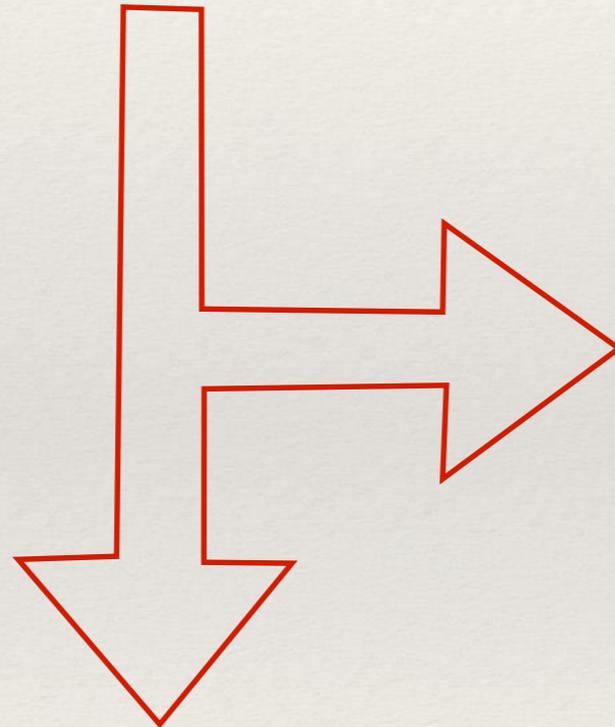
Specific Aims

- ❖ As data from electronic medical records becomes increasingly linked to the world of big data it is important that prospective researchers, especially those unfamiliar with medical record keeping, understand the potential pitfalls that exist.
- ❖ The Big Bad Data project is intended to help investigators to understand those pitfalls that exist within the problem list of these records. As a part of the project, this study was designed to examine errors that may occur with the use of specific diagnoses.
- ❖ The diagnoses under scrutiny were those for which an inverse diagnosis exists representing the opposite pathologic state.
- ❖ However, while conducting this review the investigators discovered some variability among providers in how the problem list is managed in relation to these diagnoses. Therefore the principal objective of this study is to report the errors and variability in problem list management for this specific set of diagnoses.

Chart Review

Sample Selection

6,955 records identified by flowcast ID were obtained from an EMR Query for patients seen in outpatient clinics with one of 20 diagnosis codes listed on their problem list



45 records were excluded because they did not contain lab reports, did not have the correct diagnosis, or the patient was under the age of 18

140 records with thyroid or potassium related diagnoses were randomly selected from this list with the aid of an online random integer generator ²

Sample Characteristics

- ❖ Average age of 59 ($\sigma = 20$)
- ❖ Average of 15 ($\sigma = 10$) problems on the active problem list
- ❖ Average of 17 ($\sigma = 15$) office visits in the EMR
- ❖ Average of 3 ($\sigma = 2$) different locations of care for office visits

Chart Review

- ❖ Conducted an initial review looking for errors and discovered the following:
 1. Variability in when and under what circumstances providers added a diagnosis to the problem list
 2. Scenarios with variability in how providers made problem list designations for a patient's condition

Second Chart Review

- ❖ The following data were collected
 - ❖ Who added the diagnosis to the problem list (provider credentials and location of care)
 - ❖ Whether the diagnosis was new or established
 - ❖ Conditions under which the diagnosis was added (preload, first visit, next visit, etc...)
 - ❖ Instances where a provider did not add a diagnosis that appeared to be present based upon evidence in the record
 - ❖ In scenarios that presented variability in how to characterize a problem on the problem list, provider characteristics and problem list designations were recorded

Results

Errors in the Problem List for these Specific Diagnoses

Table 1

Errors	n	Error Classification	Error Rate (per 100 records)
historical diagnosis listed when problem is active	3	failure to update error	5.0
duplicate diagnosis listed	4		
inverse diagnosis indicated by clinical evidence	2	look alike error	1.4
diagnosis removed while problem is active	3	unknown error	2.1
diagnosis not supported by test results	4	justification error	2.9
Total	16	N/A	11.4 (C.I.95%: 6.1,16.7)

- ❖ Errors classified based upon the taxonomy that has been described elsewhere⁶
- ❖ May be disagreement about what really constitutes an error
- ❖ “Look alike error” rate of 1.4 per 100 records
- ❖ Overall error rate 11.4 (± 5.26) per 100 records

Variability in Problem List Designation for a Given Condition

Results

- ❖ Total of 40 examples of the different scenarios found during the chart review
- ❖ 30 of the problem list choices were made by physicians, 4 by physicians assistants, 5 by nurses, 1 by a medical assistant
- ❖ 9 different locations of care
- ❖ Results indicate that there is some variability in what diagnoses providers use to describe similar conditions

Table 2

Scenario	n	Problem List Variants	Percent
Patient with hypokalemia develops elevated potassium	4	remove hypokalemia, add hyperkalemia	25.0%
		leave hypokalemia add hyperkalemia	25.0%
		leave hypokalemia	50.0%
Potassium WNL but Rx given for cramps	2	no diagnosis added to problem list	50.0%
		hypokalemia added to problem list	50.0%
Potassium normalizes without therapy	3	diagnosis removed from problem list	66.7%
		diagnosis not removed from problem list	33.3%
Hypothyroid, post thyroidectomy	19	hypothyroidism & history of thyroidectomy	10.5%
		hypothyroidism & thyroid malignancy or mass	26.3%
		hypothyroidism - status post thyroidectomy	10.5%
		thyroid malignancy	10.5%
		hypothyroidism	42.1%
Hypothyroid post ablation therapy for Grave's disease	3	hyperthyroidism & hypothyroidism, post-radiation	33.3%
		hypothyroidism	66.7%
Evidence of Hashimoto's Thyroiditis	7	hypothyroidism, acquired NEC	14.3%
		hypothyroidism & hyperthyroidism subclinical & other specified disorders thyroid	14.3%
		goiter unspecified & hypothyroidism	14.3%
		abnormal thyroid function tests & hypothyroidism	14.3%
		hypothyroidism	14.3%
		hypothyroidism & Hashimoto's thyroiditis	28.6%
		panhypopituitarism	50.0%
Hypothyroidism post radiation of pituitary	2	panhypopituitarism & hypothyroidism, secondary	50.0%

Table 4

Problem List Update	Total	Diagnosis Added to the Problem List:			
		During Preload or First Office Visit	After First Abnormal Report Received	At the Next Office Visit After First Abnormal Report	Other (office visit, lab order, unknown)
Total	140	84 (60.0%)	9 (6.4%)	13 (9.3%)	34 (24.3%)
New Diagnosis	40 (28.6%)	3 (7.5%)	8 (20.0%)	12 (30.0%)	17 (42.5%)
Established Diagnosis	100 (71.4%)	81 (81.0%)	1 (1.0%)	1 (1.0%)	17 (17.0%)

Variability in When to Add a Diagnosis to the Problem List

Results

- ❖ 84 diagnoses added by physicians, 11 by PAs, 15 by nurses, 4 by medical assistants, 26 unknown (preload)
- ❖ 15 different locations of care
- ❖ Providers vary in their practice of adding new a diagnosis to a patients problem list
- ❖ Less variability with established diagnoses
- ❖ Consistent with the results of the survey
- ❖ 44 records contained instances where providers did not add a diagnosis that appeared to be present

Survey

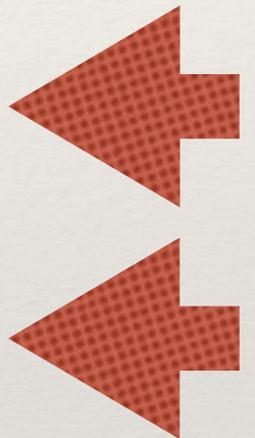
Survey of Faculty and Residents

- ❖ Survey was designed based on the types of variability found during the chart review using Qualtrics Survey Software
- ❖ Submitted to and approved by the IRB
- ❖ Distributed by email to physician faculty and residents in this department
- ❖ 57 individuals (22 physician faculty, 35 residents)
- ❖ Current response rate = 22.8%
- ❖ Survey respondents were instructed to “select the answer that most closely reflects the action you would probably take in routine clinical practice”

Survey Results

Table 3

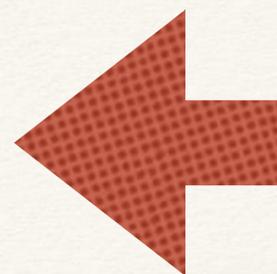
Survey Question	Responses	Percent
A patient with hypokalemia is treated with daily potassium chloride supplements. The patient subsequently develops elevated potassium levels. How would you probably manage this patient's problem list?	remove hypokalemia and add hyperkalemia	15.4%
	leave hypokalemia and add hyperkalemia	30.8%
	leave hypokalemia and make no other changes	38.5%
	remove hypokalemia	0.0%
	other	15.4%
A patient with hyperkalemia on their problem list and lab reports showing historical potassium elevation has had normal BMPs at the past few office visits since their ACEI was discontinued. How would you probably manage this patient's problem list?	remove hyperkalemia	15.4%
	leave hyperkalemia	15.4%
	change the diagnosis to hx of hyperkalemia	53.8%
	other	15.4%
How would you probably list hyperkalemia that is due to chronic kidney disease on a patient's problem list?	list it below chronic kidney disease and indented to indicate that it is secondary	7.7%
	list it with free text entry that states "secondary to chronic kidney disease"	46.2%
	list it separately on the problem list with no modifications	46.2%
	other	0.0%
When would you probably add a diagnosis of hypokalemia to a patient's problem list?	when the laboratory abnormality first appears	30.8%
	when a repeat test is also abnormal	46.2%
	when the patient is symptomatic	0.0%
	when treatment is recommended	23.1%
	other	0.0%



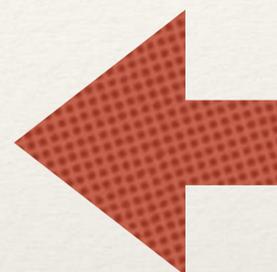
- ❖ The survey results indicate that there is some variability in:
 - When to add a diagnosis to the problem list
 - What diagnoses to use in certain scenarios

Table 3

Survey Question	Responses	Percent
A patient comes to your clinic for the first time. They report taking levothyroxine for hypothyroidism. How would you probably manage this patients problem list?	hypothyroidism would already be added to the problem list by someone else in the clinic (nurse, assistant, etc...)	15.4%
	you would add hypothyroidism to the problem list when you are writing up your note for this office visit	76.9%
	you would add hypothyroidism to the problem list only if this problem is addressed at this office visit	7.7%
	you would add hypothyroidism to the problem list only when you need to prescribe a medication, order tests, or make a referral for this problem	0.0%
	other	0.0%
A patient presents to your clinic with symptoms that are consistent with hypothyroidism. The lab work you order comes back the next day and reveals an elevated TSH which confirms this diagnosis. When would you probably add this diagnosis to the patient's problem list?	you would add this diagnosis immediately after reviewing these lab results	53.8%
	this diagnosis would be added to the problem list by whomever in the office contacts the patient with their lab results	0.0%
	you would add this diagnosis when you need to prescribe medication or order tests for this problem	23.1%
	you would add this diagnosis to the problem list at the next office visit with this patient	7.7%
	other	15.4%
A patient with Grave's disease is treated with radiation therapy. The patient now needs levothyroxine because of resulting hypothyroidism. How would you probably manage this patient's problem list?	remove hyperthyroidism and add hypothyroidism	15.4%
	change to hx of hyperthyroidism and add hypothyroidism	7.7%
	leave hyperthyroidism and add hypothyroidism	0.0%
	remove hyperthyroidism and add post ablative hypothyroidism	7.7%
	change to hx of hyperthyroidism and add post ablative hypothyroidism	46.2%
	leave hyperthyroidism and add post ablative hypothyroidism	0.0%
	remove hyperthyroidism and add other iatrogenic hypothyroidism	0.0%
	change to hx of hyperthyroidism and add other iatrogenic hypothyroidism	15.4%
	leave hyperthyroidism and add other iatrogenic hypothyroidism	0.0%
	other	7.7%
A patient with lab work that is consistent with hypothyroidism and positive antimicrosomal antibodies presents to your clinic. How would you probably manage this patients problem list?	add Hashimoto's thyroiditis	38.5%
	add hypothyroidism	23.1%
	add Hashimoto's thyroiditis and hypothyroidism	30.8%
	other	7.7%
A patient who is treated with radiation therapy for a brain tumor develops pituitary dysfunction and begins treatment with levothyroxine. How would you probably manage this patients problem list?	add panhypopituitarism	15.4%
	add secondary hypothyroidism	15.4%
	add panhypopituitarism and secondary hypothyroidism	7.7%
	add iatrogenic pituitary disorder	7.7%
	add iatrogenic pituitary disorder and secondary hypothyroidism	46.2%



Established Dx



New Dx

Discussion

Conclusions

- ❖ Results indicate variability exists in:
 - When providers add problems to a patient's problem list
 - What diagnoses they use to describe certain conditions
 - The type of providers contributing to the problem list
- ❖ Big data scientists should use caution when utilizing problem list information to:
 - Precisely identify a patient's condition
 - Make an inference about temporal associations between any variable and the appearance of a diagnosis on the problem list

Limitations of the Study

- ❖ Only examined the use of a limited number of diagnoses
- ❖ Small sample size for the individual scenarios
- ❖ Only surveyed physicians in one department (Family and Preventive Medicine)
 - However, this location of care (FMC) was associated with 32.1% of all problems added to the problem list in this study (largest single group)
 - Family medicine locations in general (including Mid Del and Fountain Lake) were associated with 47.9% of all problems added to the problem list
 - Consistent with previous research⁴
- ❖ Included records that were available since this EMR system was first used
 - Possibility that providers become more consistent in usage of the problem list over time
 - Survey results suggest this is not true

Discussion

- ❖ Is this issue an unavoidable attribute of the problem list in its current form?
 - Historical vs. present
 - Using the EMR to create the problem list may contribute
 - Direct comparison between electronic and paper problem list needed
 - Possibly an outdated concept
- ❖ Does this issue indicate a need for providers to undergo more extensive and standardized training in data entry?
 - Some push in the medical education community for this⁵
- ❖ Further research will be needed to answer these questions

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