The Importance of Data Literacy for Advanced Practice Leaders

Mike Russo, PA-C
Director, Surgical Advanced Practice
Hartford Hospital
Hartford, CT

Hartford HealthCare
Hartford Hospital

Disclosures

I have no relevant relationships with ineligible companies to disclose within the past 24 months.

Learning Objectives

At the conclusion of this session, participants should be able to:

- Describe practical strategies to create a data culture including training programs, data visualization tools, and collaboration with data analysts
- Discuss the significance of data interpretation, analysis, and visualization in identifying trends, patterns, and opportunities for improvement
- Identify the benefits of data-driven decision-making and the role of data in driving quality improvement initiatives

Hartford Hospital Facts

- Licensed Beds (incl. bassinets): 867
- Level 1 Trauma Center
- Transitions from Inpatient Care: 45,093
- ED Visits: 108,249
- Inpatient Surgeries: 12,871
- Ambulatory Surgeries: 23,712
- Colleagues: 6,725
- Physicians on Staff: 1,842
- APPs On-Staff: 783
- Residents/Fellows: 756

What started my path to "nerdhood"?

Hartford HealthCare
Hartford Hospital

Six Sigma Training is where it started….

- The lecture title…"What does 99% mean?"
  - 20,000 lost articles of mail
  - Unsafe drinking water for 15 min/day
  - 5000 incorrect surgical procedures each day
  - 2 airline accidents per day
  - 200,000 incorrect prescriptions each day
  - 11.8 million shares traded incorrectly on the NYSE each day
  - 48,000 to 96,000 deaths attributed to hospital errors each year

A little about you….

How do you work with data?

- Where do you primarily practice and/or supervise staff?
  A. Inpatient
  B. Outpatient
  C. Both Inpatient and Outpatient
  D. Emergency Medicine

Where do you primarily practice and/or supervise staff?

0

Inpatient

0%

Outpatient

0%

Both Inpatient and Outpatient

0%

Emergency Medicine

0%

How do you work with data?

- What is the highest level of interaction you have with data?
  A. Look at finished analysis and receive reports/summary of data
  B. Work with cleaned data to generate visuals and summaries
  C. Work with raw data that you then clean, analyze and use to create visuals
  D. Develop/write reports to mine raw data from one or more sources

What is the highest level of interaction you have with data?

0

Look at finished analysis and receive reports/summary of data

0%

Work with cleaned data to generate visuals and summaries

0%

Work with raw data that you then clean, analyze and use to create visuals

0%

Develop/write reports to mine raw data from one or more sources

0%

How do you work with data?

- How would you describe the availability of data in your organization?
  A. Readily available and easy to access
  B. Takes a bit of work but I can get what I need
  C. Long arduous process that renders the data I eventually receive useless and out of date
  D. I'd have better luck a six-figure raise

How would you describe the availability of data in your organization?

0

Readily available and easy to access

0%

Takes a bit of work but I can get what I need

0%

Long arduous process that renders the data I eventually receive useless and out of date

0%

I'd have better luck a six-figure raise

0%

How do you work with data?

- How would you describe the availability of "GOOD" data in your organization?
  A. Readily available and easy to access
  B. Takes a bit of work but I can get what I need
  C. Long arduous process that renders the data I eventually receive useless and out of date
  D. I'd have better luck getting a six-figure raise

How would you describe the availability of "GOOD" data in your organization?

0

Readily available and easy to access

0%

Takes a bit of work but I can get what I need

0%

Long arduous process that renders the data I eventually receive useless and out of date

0%

I'd have better luck getting a six-figure raise

0%

How do you work with data?

- How many APP colleagues at your organization are proficient or have an interest in data analytic or reporting?
  A. Most of those I work with
  B. A handful here and there
  C. Few and far between
  D. No one in sight

How many APP colleagues at your organization are proficient or have an interest in data analytic or reporting?

0

Most of those I work with

0%

A handful here and there

0%

Few and far between

0%

No one in sight

0%

How do you work with data?

- To what degree do you believe collaboration between advanced practice providers and technology experts is essential for the successful implementation of clinical informatics in healthcare?
  - A. Not essential at all
  - B. Slightly essential
  - C. Moderately essential
  - D. Very essential
  - E. Extremely essential

To what degree do you believe collaboration between advanced practice providers and technology experts is essential for the successful implementation of clinical informatics in healthcare?

0

Not essential at all — 0%

Slightly essential — 0%

Moderately essential — 0%

Very essential — 0%

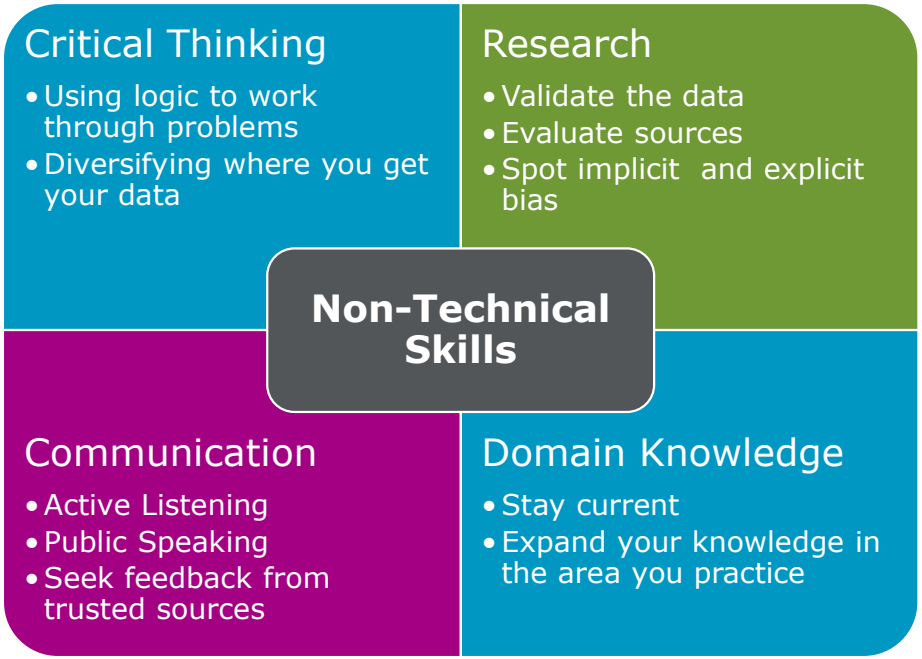
Extremely essential — 0%

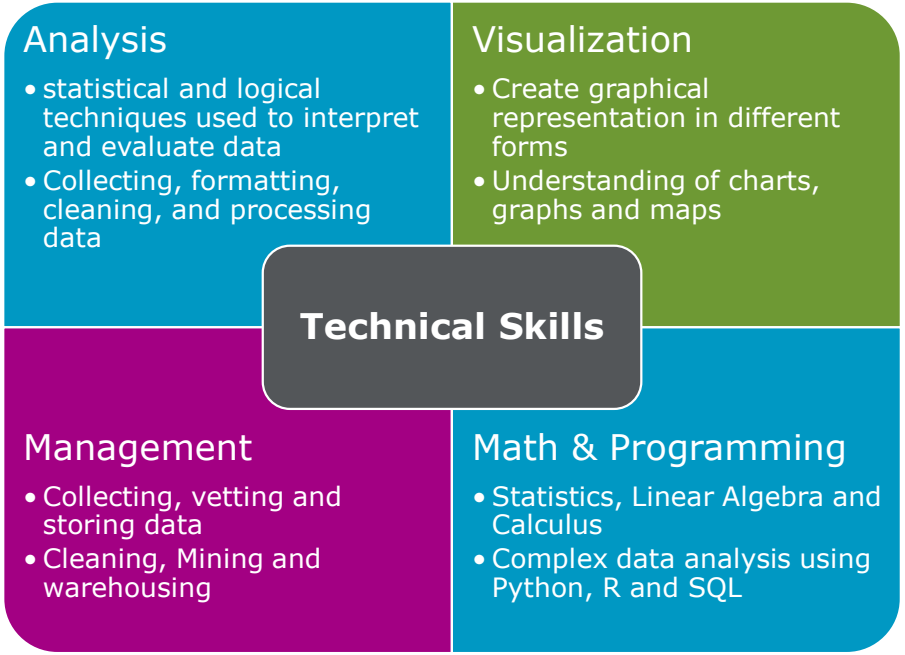
Introduction

- What is Data Literacy?
- Why is data literacy important to AP leaders?
- Where do the biggest challenges lie achieving data literacy?
- How can we develop and encourage data literacy in ourselves and our teams?
- How can we use the data with/for our staff?
- What does the future look like?

What is Data Literacy?

"The ability to explore, understand, and communicate with data in a meaningful way."

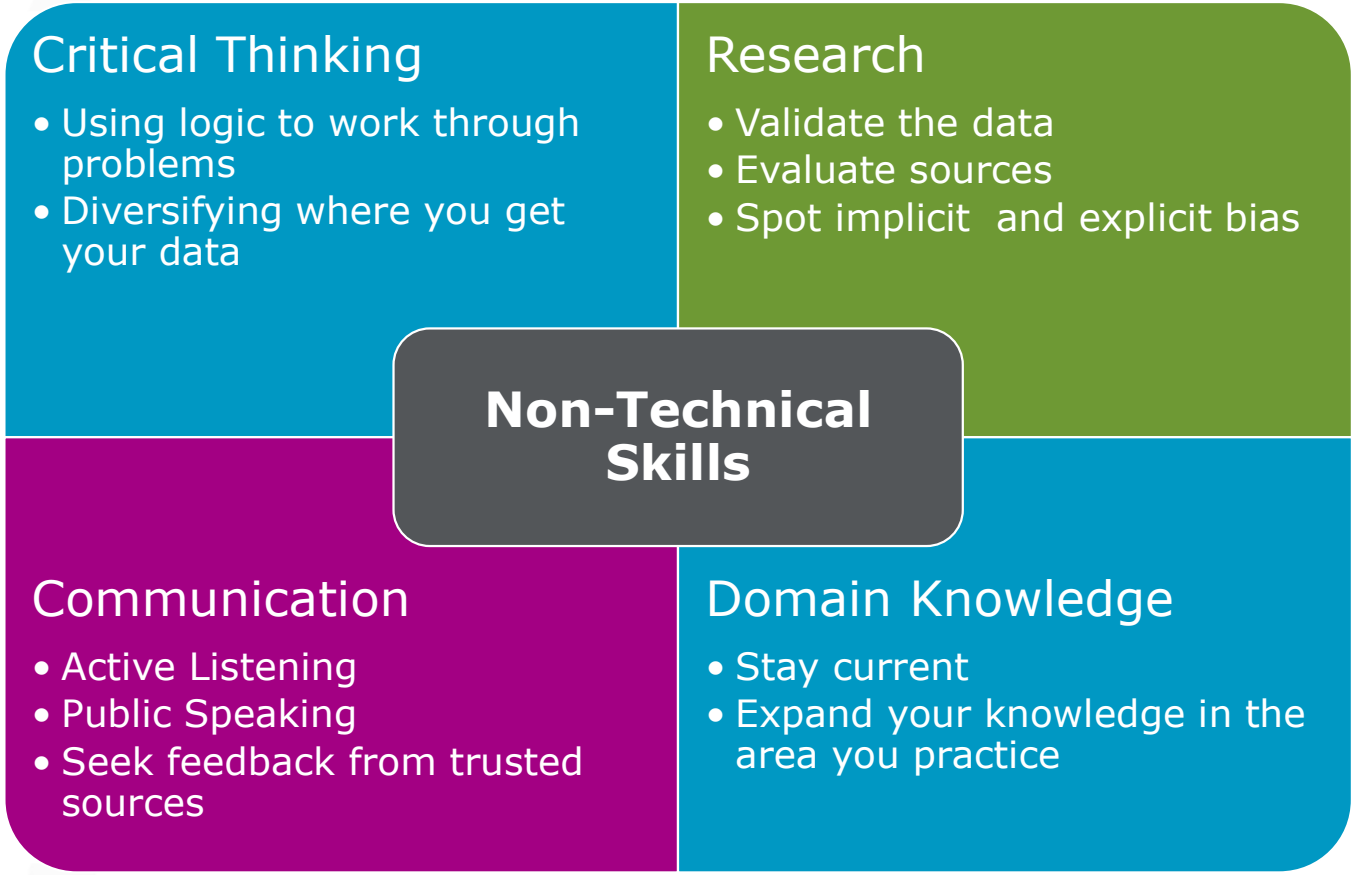




Hartford HealthCare
Hartford Hospital

What is Data Literacy?

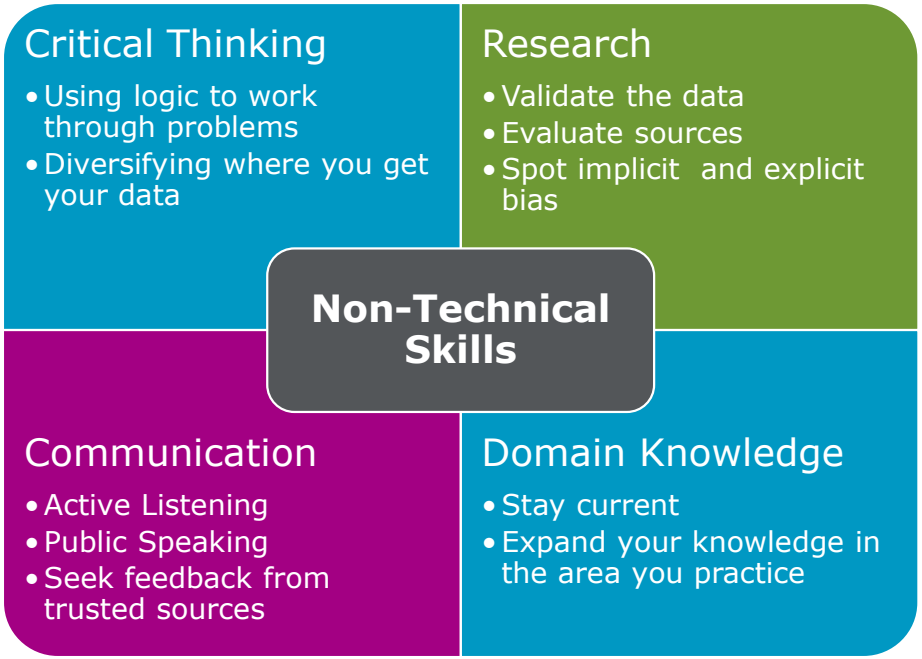
"The ability to explore, understand, and communicate with data in a meaningful way."

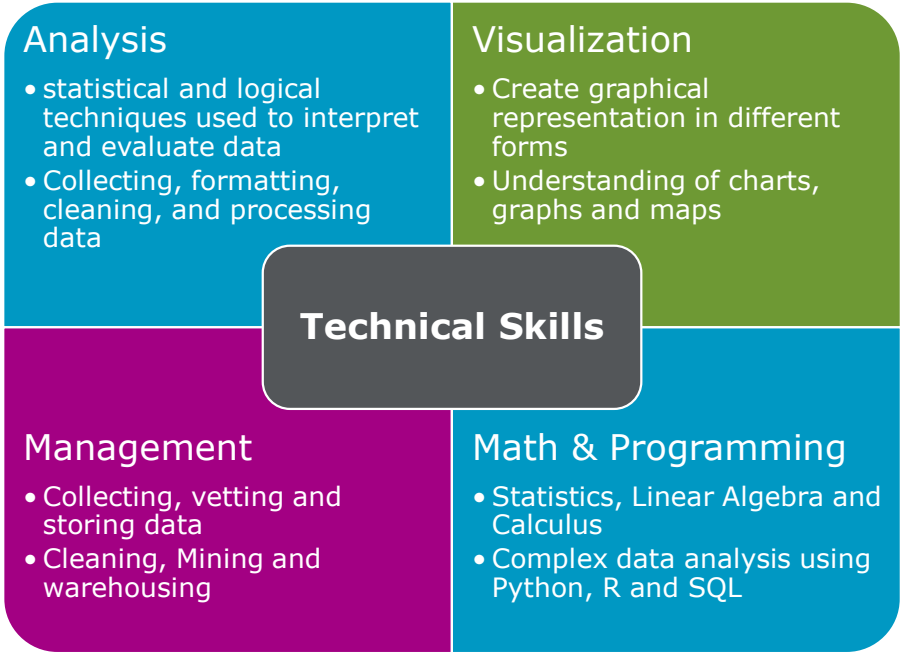


Hartford HealthCare
Hartford Hospital

What is Data Literacy?

"The ability to explore, understand, and communicate with data in a meaningful way."

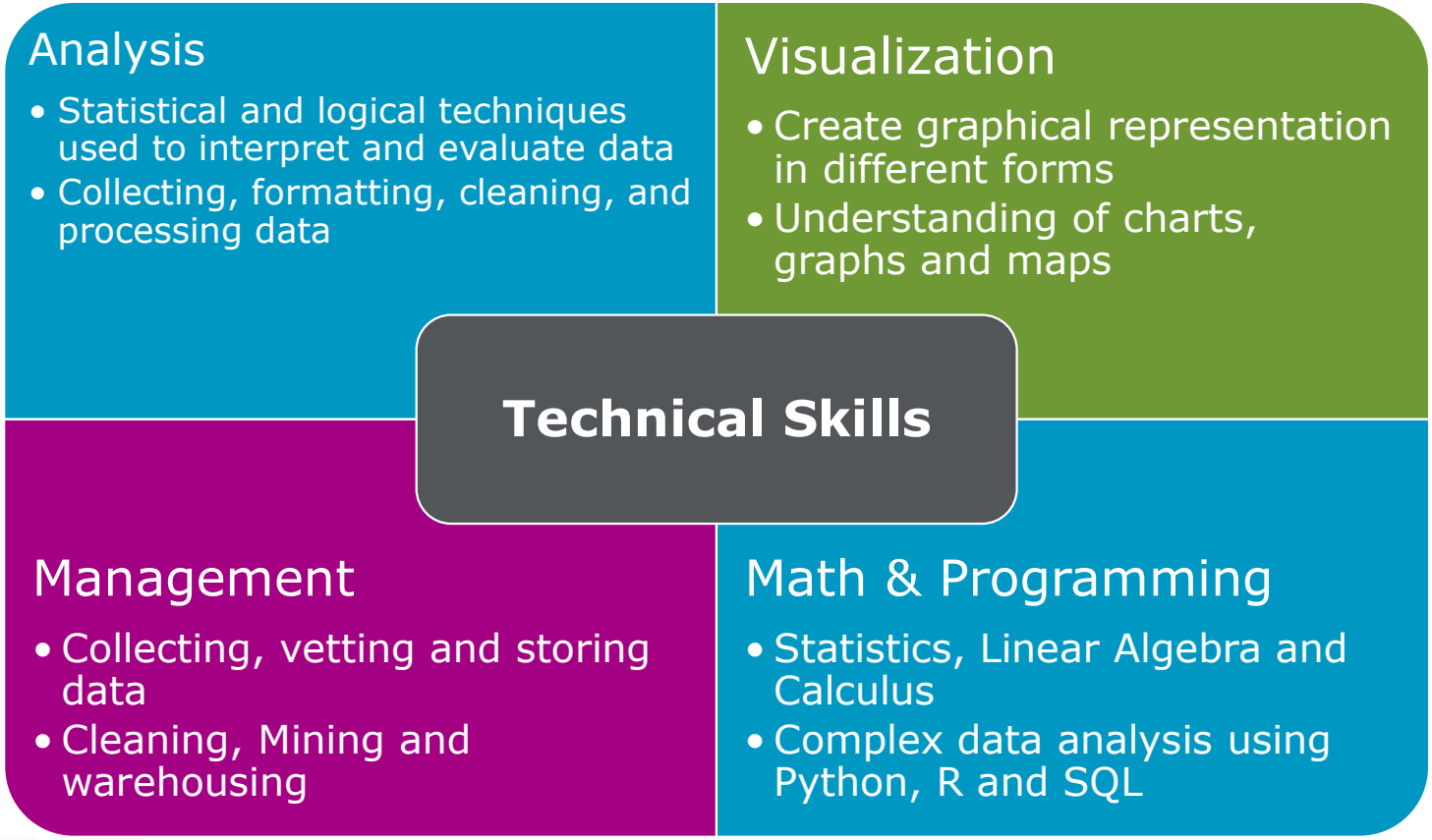




Hartford HealthCare
Hartford Hospital

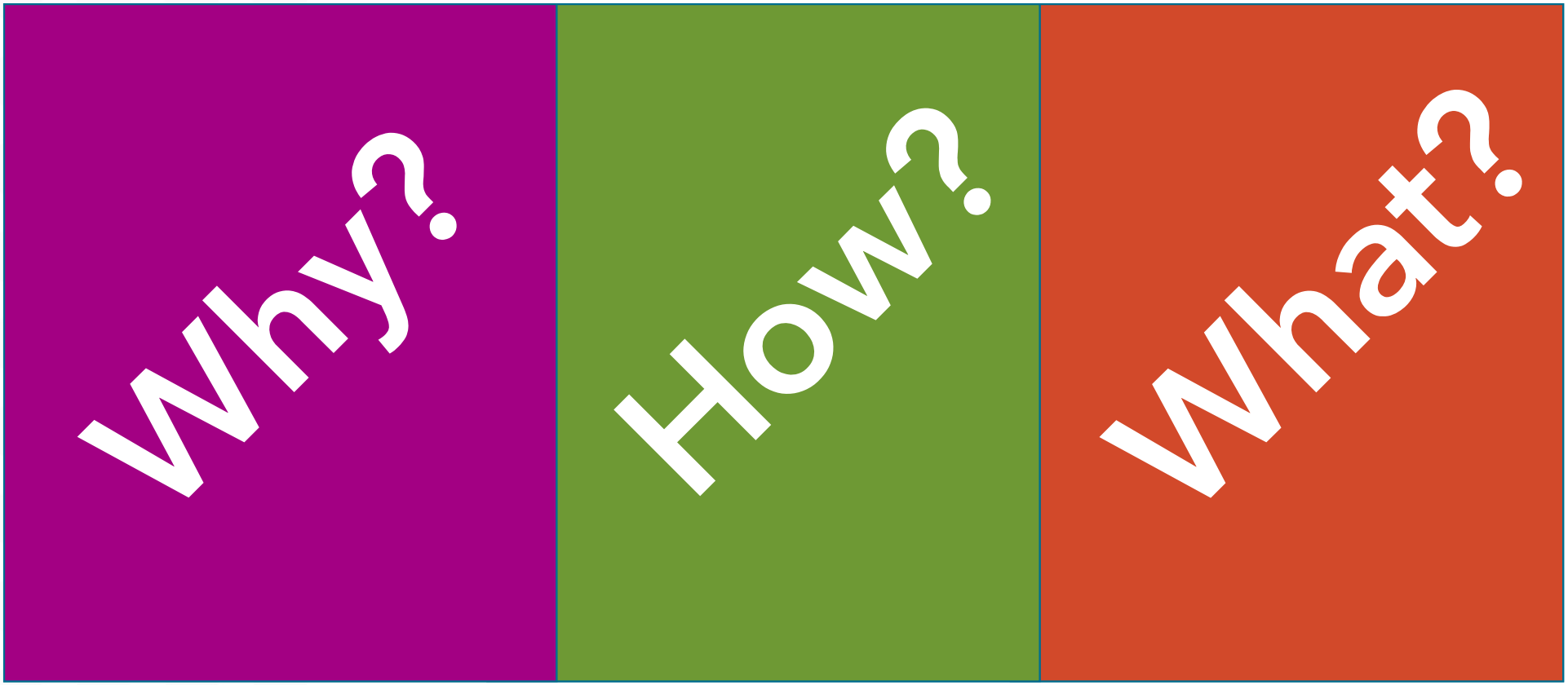
What is Data Literacy?

"The ability to explore, understand, and communicate with data in a meaningful way."



Hartford HealthCare
Hartford Hospital

Data Literacy



Hartford HealthCare
Hartford Hospital

Why is Data Literacy Important to AP Leaders?

Why?

We have a unique role in bridging the gap between clinical practice and data-driven decision-making!

Hartford HealthCare
Hartford Hospital

Why is Data Literacy Important to AP Leaders?

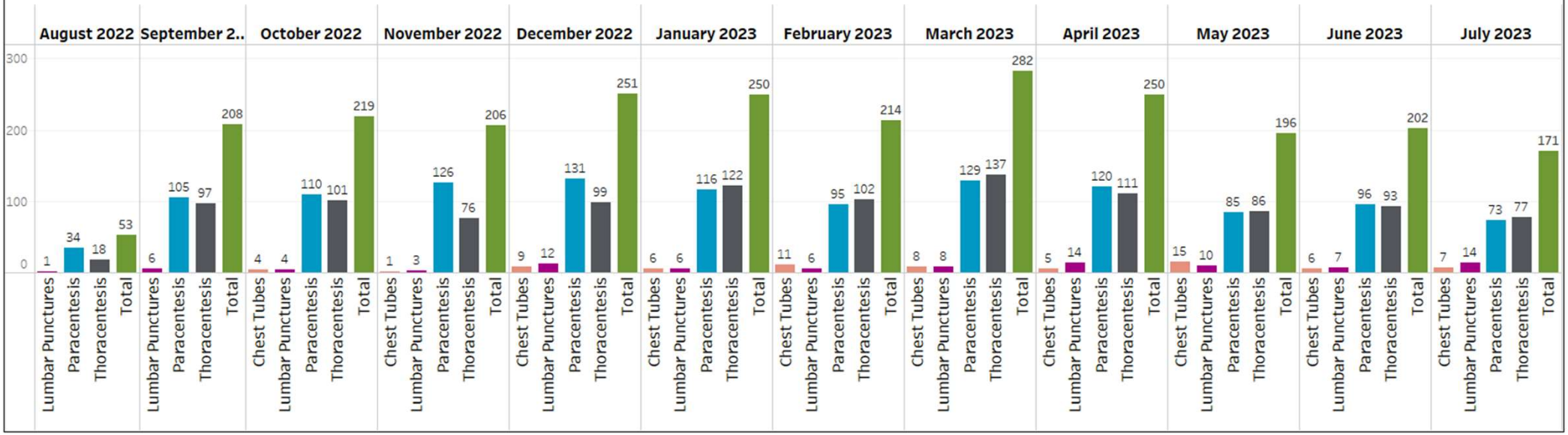
Why?

- Allows us to identify trends
- Enables the measuring of outcomes for new or existing programs and initiative
- Provides for objective evaluation of interventions
- Legitimizes and supports your conclusions and thought processes

HH Inpatient Procedure Team Dashboard

Paracentesis	Thoracentesis	Lumbar Punctures	Chest Tubes
1,258	1,151	94	74

Monthly Procedural Volume Trend



Avg Order to Procedure Time

	April 2023	May 2023	June 2023	July 2023
Chest Tubes	0.80hrs	1.47hrs▲83.33%	1.17hrs▼-20.45%	2.29hrs▲95.92%
Lumbar Punctures	1.10hrs	2.00hrs▲81.82%	2.25hrs▲12.50%	1.57hrs▼-30.16%
Paracentesis	2.06hrs	2.10hrs▲1.70%	2.16hrs▲2.98%	2.04hrs▼-5.51%
Thoracentesis	1.81hrs	1.65hrs▼-9.02%	1.36hrs▼-17.23%	1.27hrs▼-7.04%
Grand Total	**1.88hrs**	**1.84hrs▼-1.91%**	**1.76hrs▼-4.60%**	**1.66hrs▼-5.29%**

Avg Procedure Duration

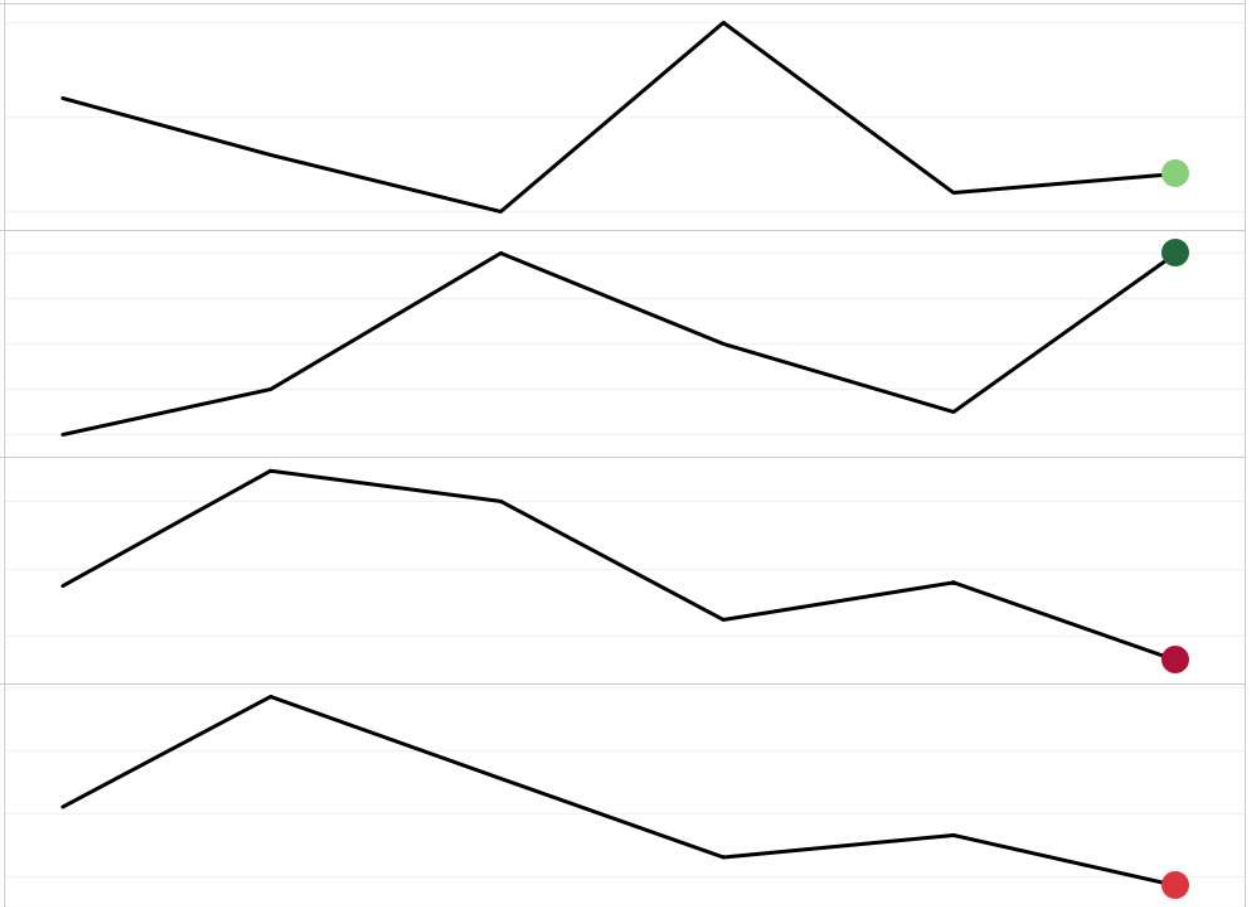
	April 2023	May 2023	June 2023	July 2023
Chest Tubes	0.40hrs	0.73hrs▲83.33%	0.50hrs▼-31.82%	0.71hrs▲42.86%
Lumbar Punctures	0.77hrs	0.90hrs▲17.00%	0.57hrs▼-36.51%	0.85hrs▲48.08%
Paracentesis	0.49hrs	0.49hrs▲1.35%	0.51hrs▲2.28%	0.50hrs▼-1.04%
Thoracentesis	0.53hrs	0.68hrs▲29.52%	0.46hrs▼-33.29%	0.55hrs▲19.73%
Grand Total	**0.52hrs**	**0.62hrs▲18.83%**	**0.48hrs▼-21.26%**	**0.56hrs▲14.72%**

Procedure Volume Tracker

PROCEDURE	Last Month's Volume	Prior Month's Volume	Change	Perecent Change
Chest Tubes	7	6	1	16.7%
Lumbar Punctures	14	7	7	100.0%
Paracentesis	73	96	-23	-24.0%
Thoracentesis	77	93	-16	-17.2%

Last 12 Weeks as of 2023-08-06

-24.0% 100.0%



The trends of Last Month's Volume, Prior Month's Volume, Change, Perecent Change, count of Custom SQL Query and Last Week Volume (copy) for BEGIN_DATE Month broken down by Header vs. PROCEDURE. For pane Last Week Volume (copy): Color shows Perecent Change. The data is filtered on Last 12 Weeks and Date Filter. The Last 12 Weeks filter keeps True. The Date Filter filter keeps True.

LOS Evaluation

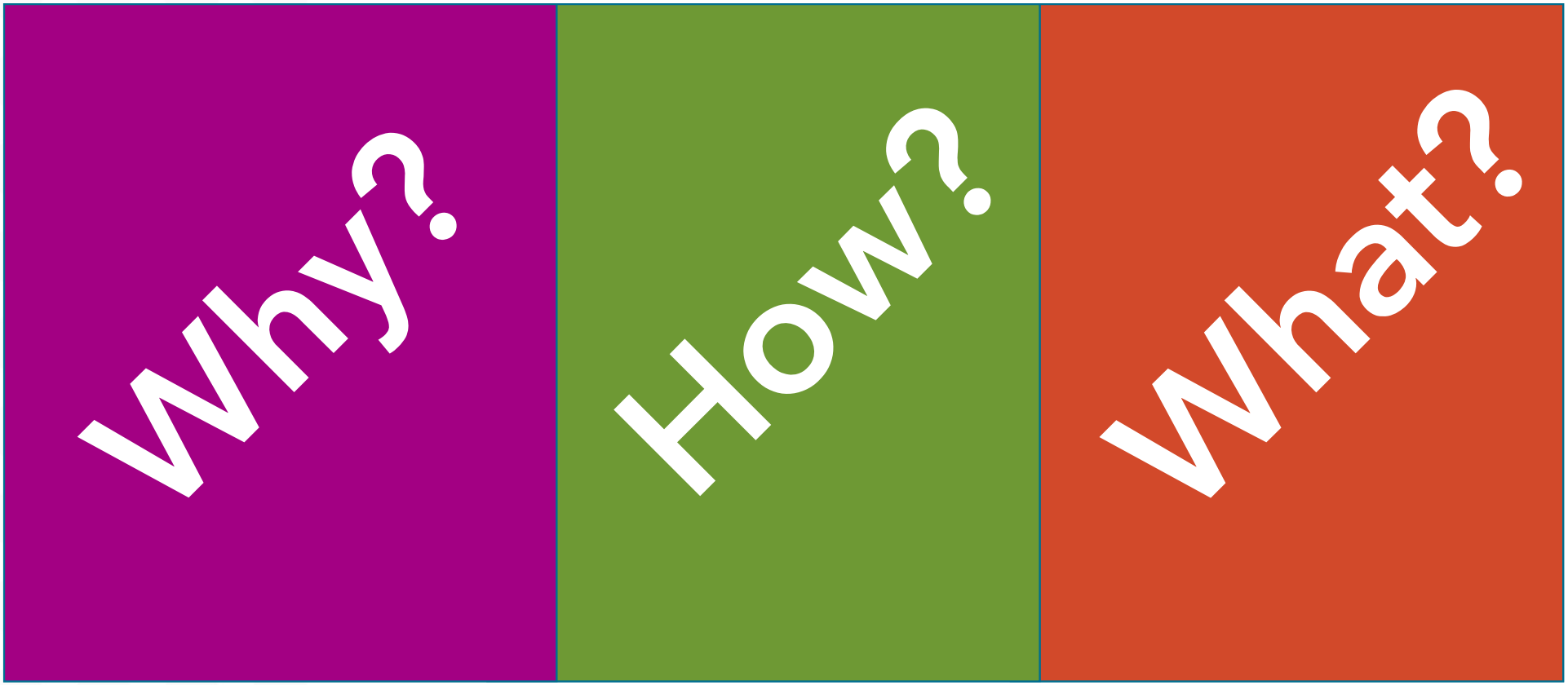
			Number of Cases	Avg. AMLOS	Difference in Avg. AML..	Avg. GMLOS	Difference in Avg. GML..	Avg. FINAL_DRG_WEIG..
LOS < 7	Paracentesis	IPT	149.0	5.4		4.1		1.5
		IR	167.0	5.3	-0.1	4.0	-0.1	1.5
	Thoracentesis	IPT	90.0	5.7		4.3		2.2
		IR	85.0	5.6	0.0	4.4	0.0	1.9
LOS < 10	Paracentesis	IPT	66.0	6.2		4.7		2.0
		IR	50.0	6.2	0.0	4.7	0.0	1.9
	Thoracentesis	IPT	58.0	6.4		4.9		2.4
		IR	48.0	6.5	0.1	5.0	0.1	2.3
LOS < 15	Paracentesis	IPT	41.0	8.0		6.0		3.0
		IR	39.0	7.7	-0.3	5.8	-0.2	2.6
	Thoracentesis	IPT	49.0	7.8		6.2		3.6
		IR	37.0	7.3	-0.5	5.7	-0.5	2.9
LOS > 15 Days	Paracentesis	IPT	69.0	8.6		6.6		3.2
		IR	49.0	8.7	0.1	6.6	0.0	3.5
	Thoracentesis	IPT	132.0	11.5		8.8		5.7
		IR	82.0	9.7	-1.8	7.5	-1.3	4.7

Why is Data Literacy Important to AP Leaders?

Why?

- Allows you to transition to data informed practice providing a foundation for:
  - Improved Patient Safety
  - Better resource allocation
  - Enhanced quality of care

Data Literacy



Hartford HealthCare
Hartford Hospital

Challenges to Data Literacy

- Limited Access to Data
- Lack of Training and Support
- Resistance to change

What?

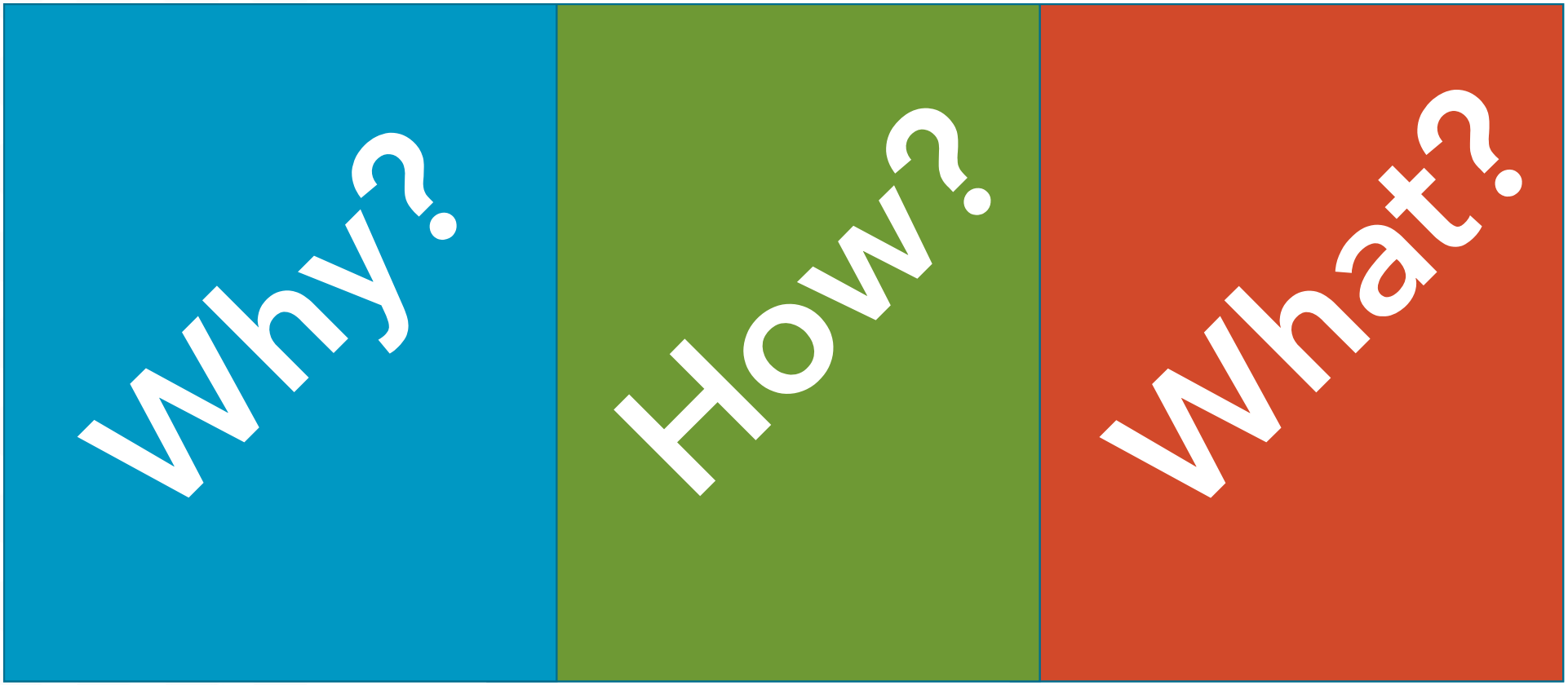
Challenges to Data Literacy

What can we do to overcome these barriers?

- Build partnerships with data experts in our organization
- Invest in training and education for your and your staff
- Create a culture of continuous improvement that drives an appetite for data

What?

Data Literacy



Hartford HealthCare
Hartford Hospital

Developing Data Literacy

Begin to develop a culture where data is woven into the core of everything you do, from operations, to mindset, and the very identity of your team.

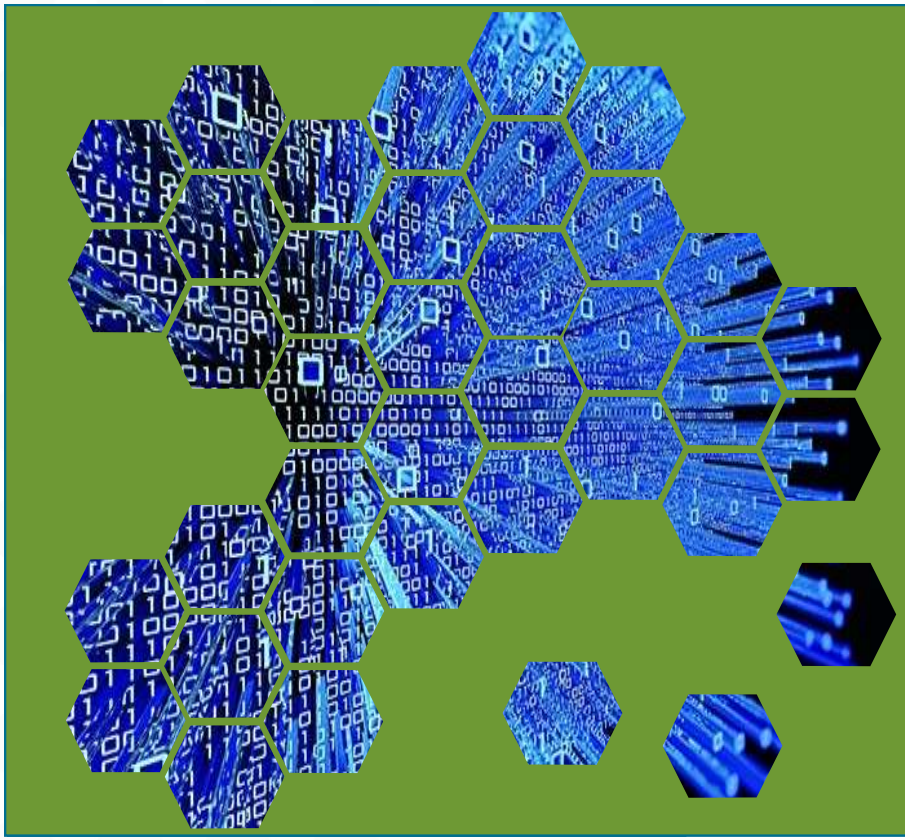
How?

Developing Data Literacy for You

How?

- Ask curious questions about the data you encounter everyday.
- YouTube!!
- Take a course
  - Epic/Cerner ect.
  - Udemy
- Begin to design project with data as a priority

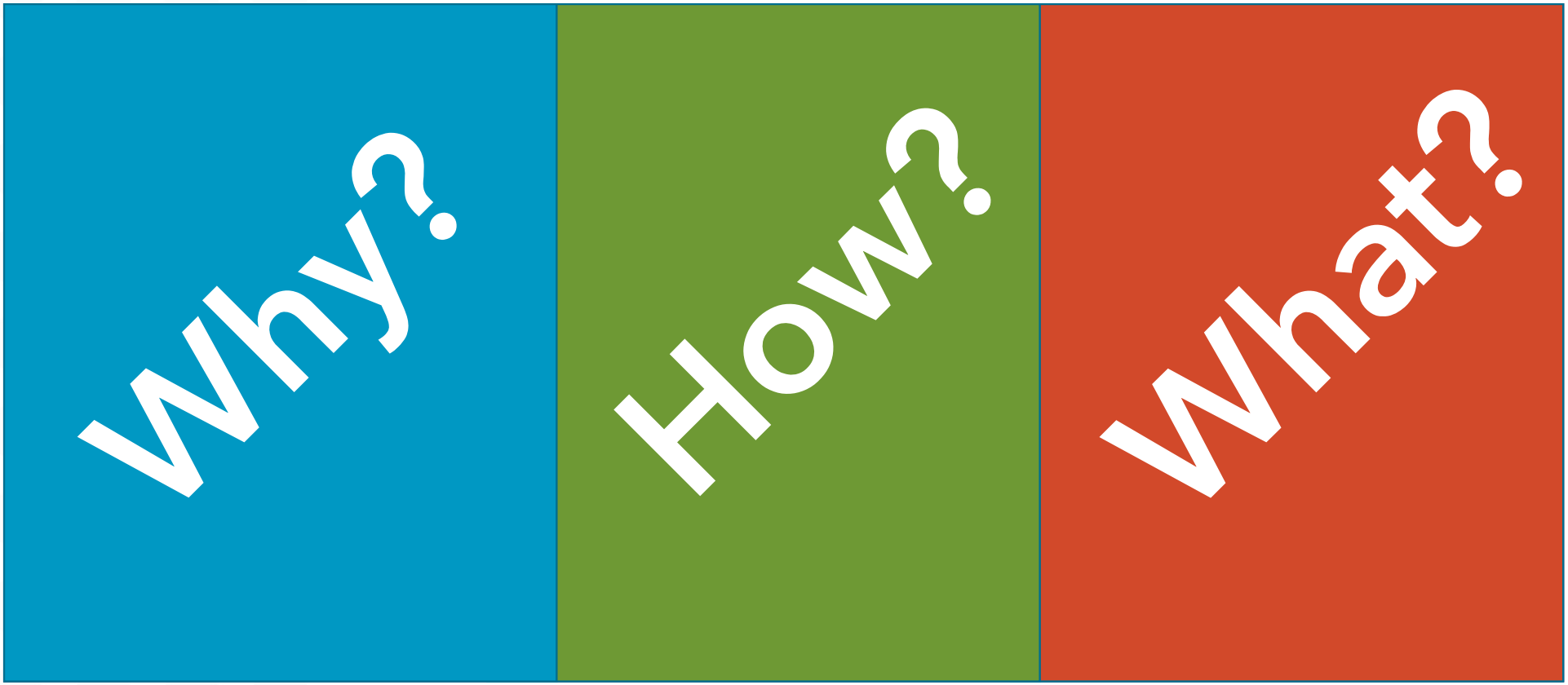
Developing Data Literacy



- Align metrics with clinical and business priorities.
- Build data sources to address critical decision points.
- Grow value through targeted use cases.
- Promote widespread data discovery.

How?

Data Literacy



Hartford HealthCare
Hartford Hospital

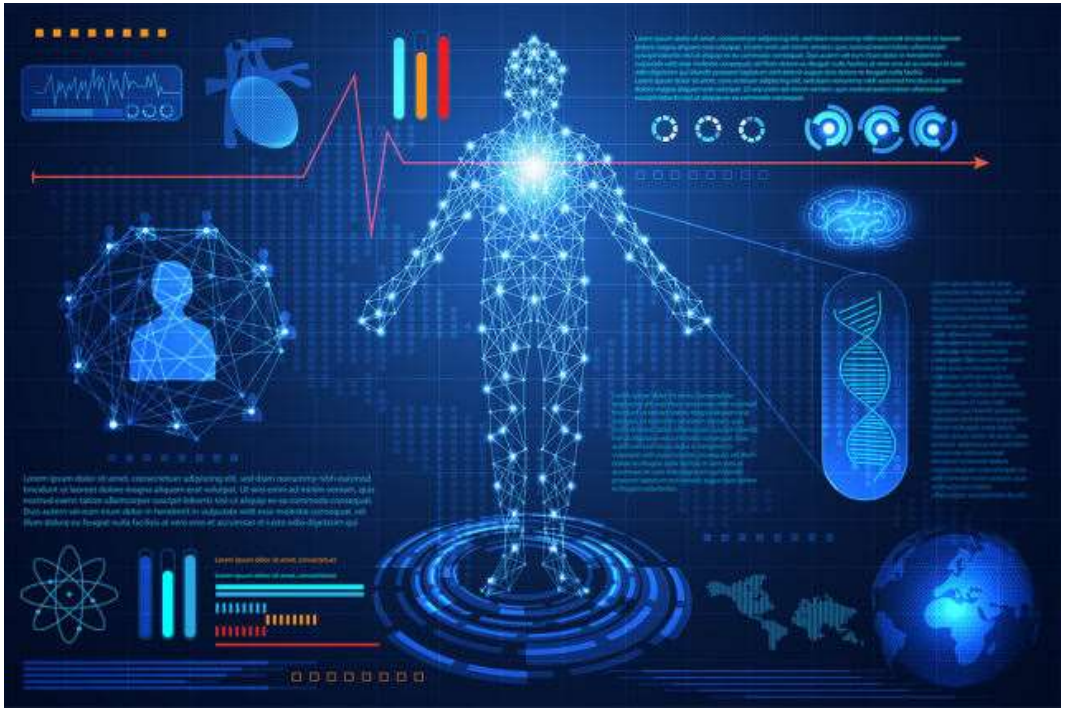
What does the future of data in healthcare look like?

(By future I mean tomorrow…It's already here)

Artificial Intelligence will change the landscape of healthcare….

But it can't happen without us!

Clinicians, for the foreseeable future are essential to the building, utilization and regulation of AI in healthcare



Hartford HealthCare
Hartford Hospital

What is Artificial Intelligence?

ChatGPT's Definition

- Artificial Intelligence (AI) refers to the development of computer systems that can perform tasks that typically require human intelligence. These tasks include learning, reasoning, problem-solving, understanding natural language, speech recognition, and visual perception. The goal of AI is to create machines or systems that can mimic cognitive functions associated with human intelligence

What are some of the subsets of AI?

- Machine Learning
- Deep Learning
- Natural Language Processing

Machine Learning

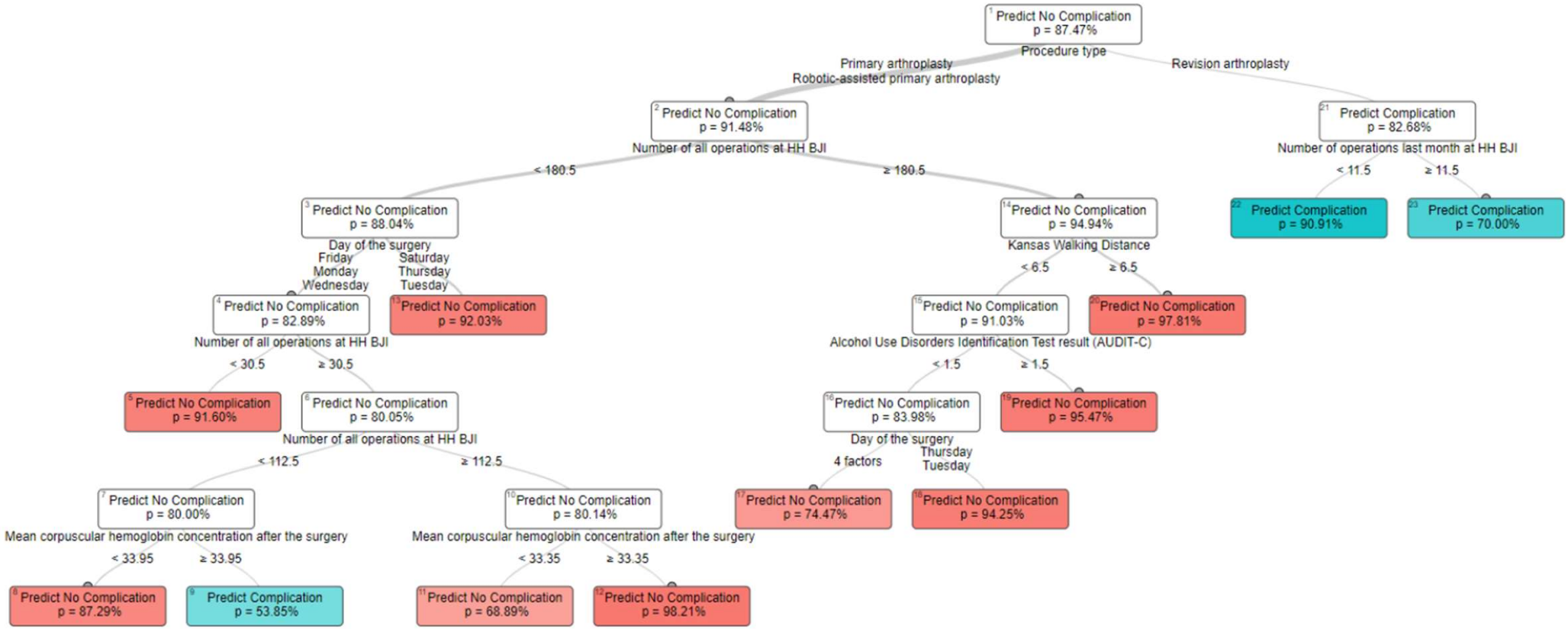
- Definition:
  - A broad concept that involves the development of algorithms and models that enable computers to learn patterns and make decisions without being explicitly programmed. Uses primarily tabular data.

- Approach:
  - It relies on various algorithms and statistical models to perform tasks, such as regression, classification, clustering, and reinforcement learning.

- Feature Engineering:
  - In traditional machine learning, human experts often play a crucial role in selecting relevant features and engineering them to improve model performance.

- Complexity:
  - While machine learning models can be complex, they generally have fewer parameters compared to deep learning models.

OCT-Hip-Periop Model



Deep Learning

- Definition:
  - Deep learning is a subset of machine learning that focuses on neural networks with multiple layers (deep neural networks).
- Neural Networks:
  - Deep learning models, particularly neural networks, are composed of many interconnected layers of nodes (neurons), allowing them to automatically learn hierarchical representations of data.
- Feature Learning:
  - Deep learning models can automatically learn relevant features from raw data, eliminating the need for extensive manual feature engineering.
- Applications:
  - Deep learning has shown remarkable success in tasks such as image and speech recognition, natural language processing, and playing complex games.
- Computational Requirements:
  - Deep learning models often require significant computational resources, and they may need large amounts of labeled data for training.

Natural Language Processing

- Definition:
  - focuses on the interaction between computers and human language. The primary goal of NLP is to enable computers to understand, interpret, and generate human language in a way that is both meaningful and contextually relevant. NLP involves a range of tasks related to language understanding and processing.
  - Uses Large Language Models
    - Typically trained in the field of interest
      - clinicalBert
        - » Medical focused large language model

So what does it do…why is it sometimes better than humans

- Humans can process a couple of variable at a time…the computer can evaluate thousands
- We often make medical decisions based on our knowledge and our own personal experience…AI can provide the experience of thousand of clinician and millions of clinical interactions
- It does not take the place of expert judgement but it can learn from that same judgement and use the outcomes to get make the model better

Regulation of AI in Healthcare

- Still not completely worked out
- FDA likely to regulate in the US
- Proposed guidelines are centered around:
  - Transparency
  - Accountability/Due Dilligence
  - Peer Reviewed

Use of AI at Hartford Healthcare – ED RN Staffing

- ED Nurse Staffing
  - Over 200 nurses
  - 10 training tiers
  - 10 positions to fill
  - 6 x 4hour blocks per day
  - 42 days per scheduling cycle
  - Manual staffing estimated to take over 88 hours of work

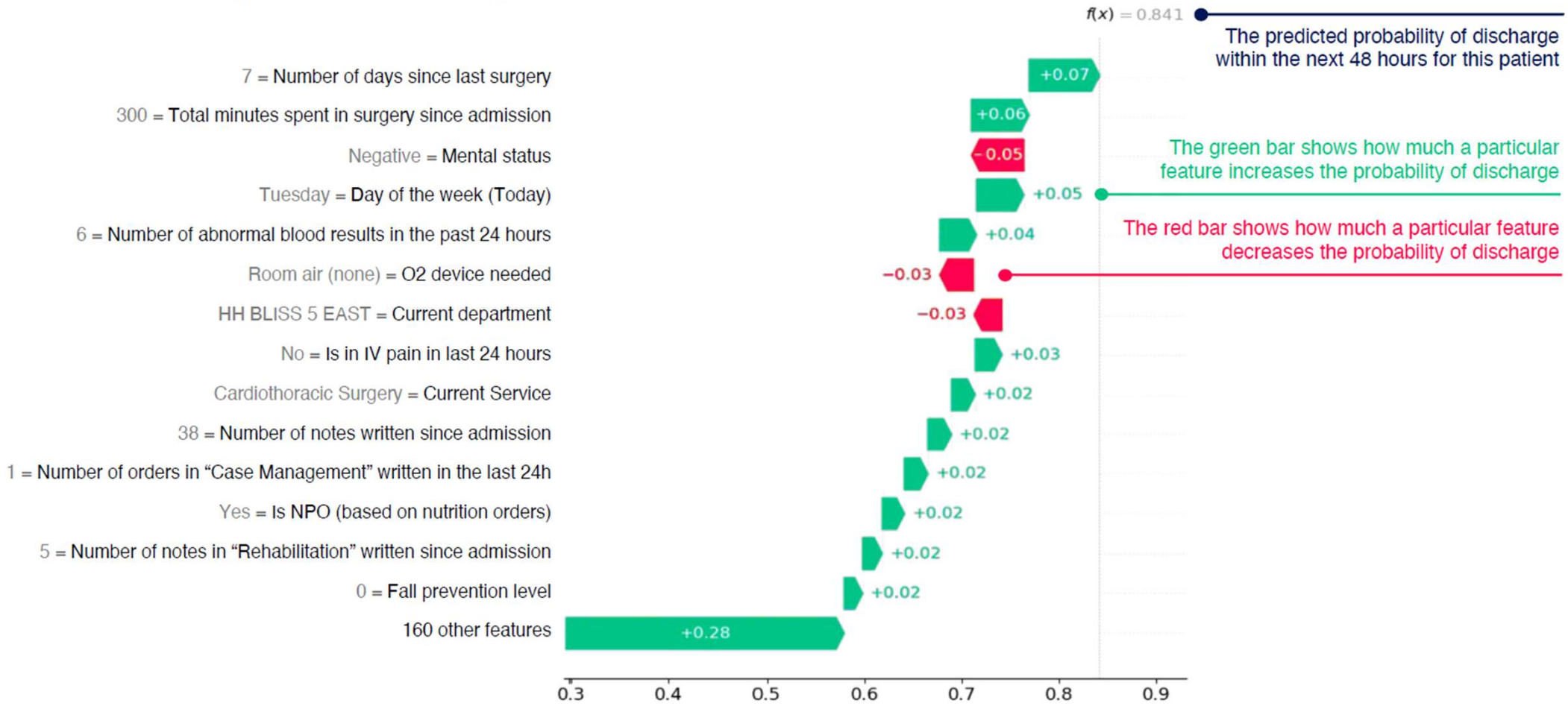
Use of AI at Hartford Healthcare – ED RN Staffing

- Model created with parameters and needs of the department
  - Results:
    - $800,000 plus in overtime saved
    - Greater than 90 nursing satisfaction
    - Fair staffing
    - Reduced training times
    - 88 hours per staffing period saved
      - Computer does the schedule in 3 minutes

Use of AI at Hartford Healthcare – Length of Stay Index

- Predictive Model
  - Estimates Expected Discharge Date
  - Alerts for patients who should be able to be discharged in next 24 hours
- Looks at over 200 variable
  - Most Important
    - Age
    - Platelet count, average heart rate also in top ten
- Has lead to a 0.67 day reduction in length of stay on pilot units
- Decreased readmission rate in the same population

An Example[1] Of Interpretable Plot



What we have in the works….

- Deterioration Index
- Surgical Infection Risk Prediction
- TAVR Valve Selection

Cannot happen without clinicians!!

- All these projects consisted of teams of medical providers to help train the models, ask the questions and set the parameters.

- APP's are well suited for these roles due to their extensive clinical knowledge and lower cost of utilization.

Summary

- Data literacy is the ability to explore, understand, and communicate with data in a meaningful way.
- The data can be utilized to drive clinical outcomes, support operations decisions and monitor for emerging trends
- AI, along with our help, will soon drastically change how healthcare is delivered in our world
- It can start with you…..

If you build it they will come…to you for more and more!

Hartford HealthCare
Hartford Hospital

References

- Carter, D. P. (2022, August 30). *How Good is 99 Percent?* David Paul Carter. https://www.davidpaulcarter.com/2015/06/01/how-good-is-99-percent/
- Forrester. (2022). *Building Data Literacy*. Tableau. https://www.tableau.com/sites/default/files/2022-03/Forrester_Building_Data_Literacy_Tableau_Mar2022.pdf
- Data literacy explained: Definition, importance, examples, and more. (2023, August 18). https://www.tableau.com/data-insights/data-literacy/skills
- Na, L., Carballo, K. V., Pauphilet, J., Haddad-Sisakht, A., Kombert, D., Boisjoli-Langlois, M., ... & Bertsimas, D. (2023). Patient Outcome Predictions Improve Operations at a Large Hospital Network. *arXiv preprint arXiv:2305.15629.*
- *What is Machine Learning? | IBM. (n.d.). https://www.ibm.com/topics/machine-learning#:~:text=the%20next%20step-,What%20is%20machine%20learning%3F,rich%20history%20with%20machine%20learning.*
- *Bertsimas, Dimitris. "AI in Healthcare: Binary Classification." Analytics Edge in Healthcare, 8 January 2024, Hartford Healthcare. Lecture*

Hartford HealthCare

Hartford Hospital