Institute for Healthcare Improvement

C7 Artificial Intelligence and QI

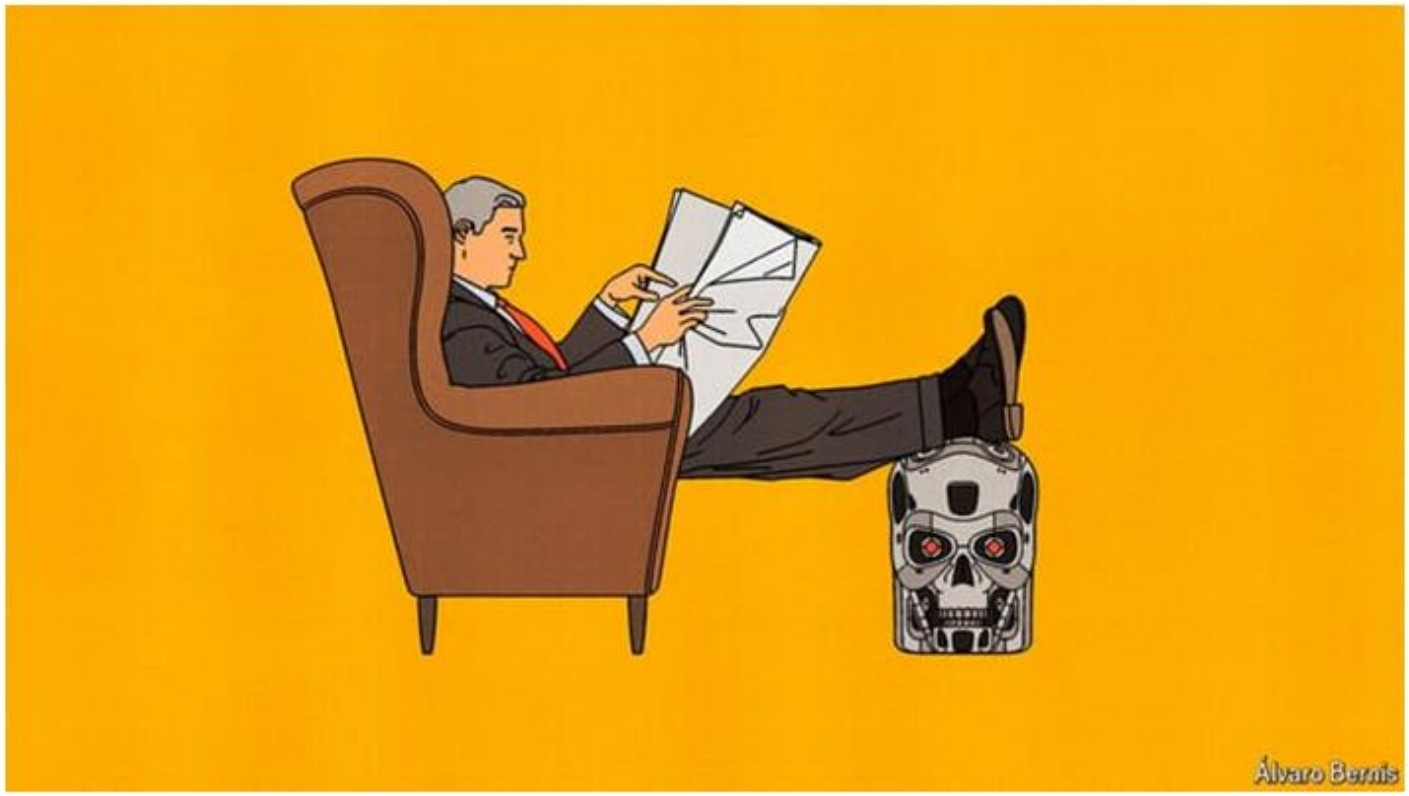
The Worriers

“The alarm bell I’m ringing has to do with the existential threat of them taking control.”

“It’s quite conceivable that humanity is just a passing phase in the evolution of intelligence.”

-**Geoffrey Hinton**, formerly Google, seminal figure in AI development,

https://www.forbes.com/



Free exchange

What will humans do if AI solves everything?

Welcome to an artificial-intelligence Utopia

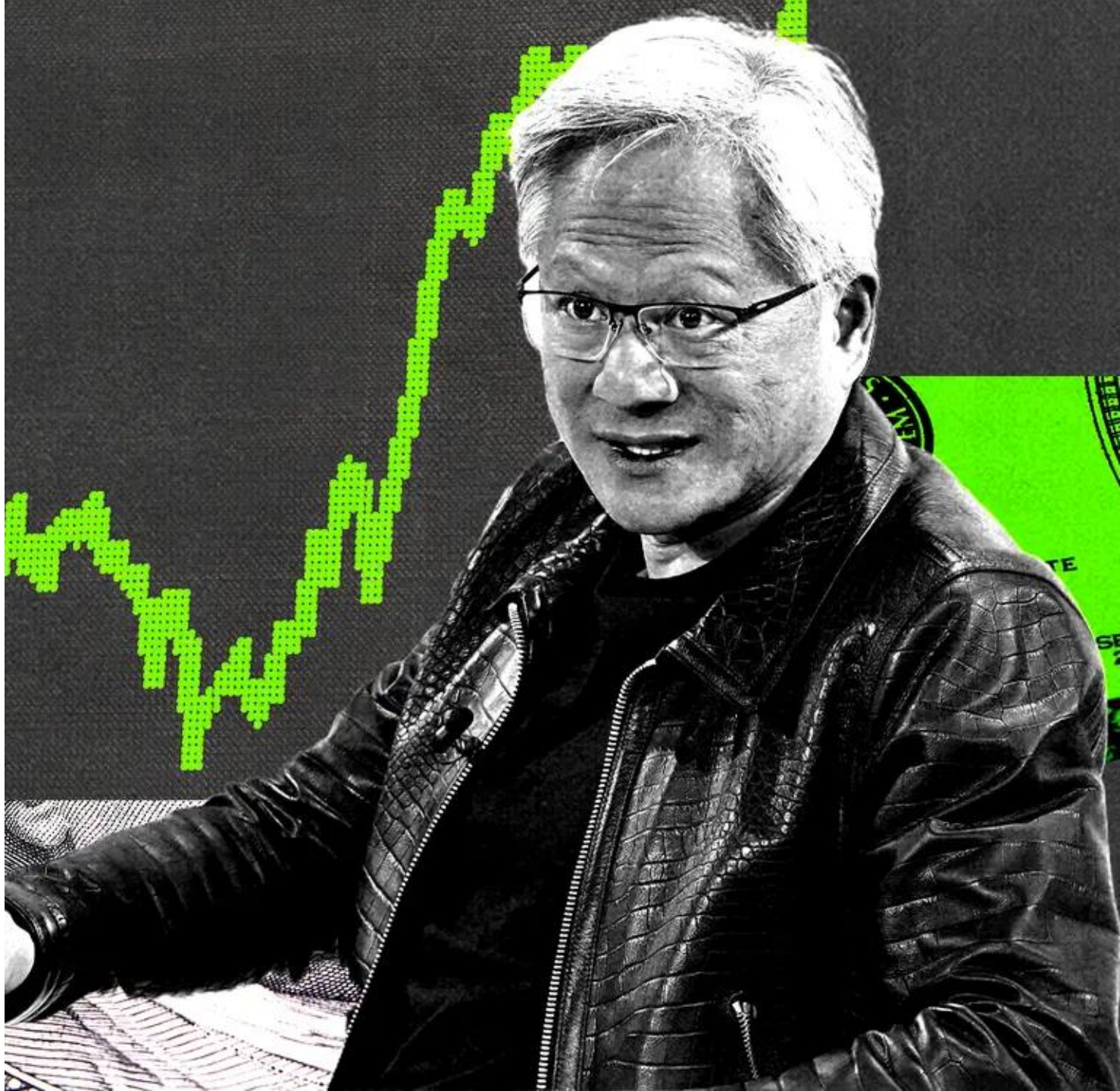
The optimists

“I know how it works, so there’s nothing there. It’s no different than how microwaves work….All it’s doing is processing data. There are so many other things to worry about.”

“Reasoning capability is two to three years out.”

-**Jensen Huang**, CEO, Nvidia, in *The New Yorker*

https://www.newyorker.com/magazine/2023/12/04/how-jensen-huangs-nvidia-is-powering-the-ai-revolution



Key Terms

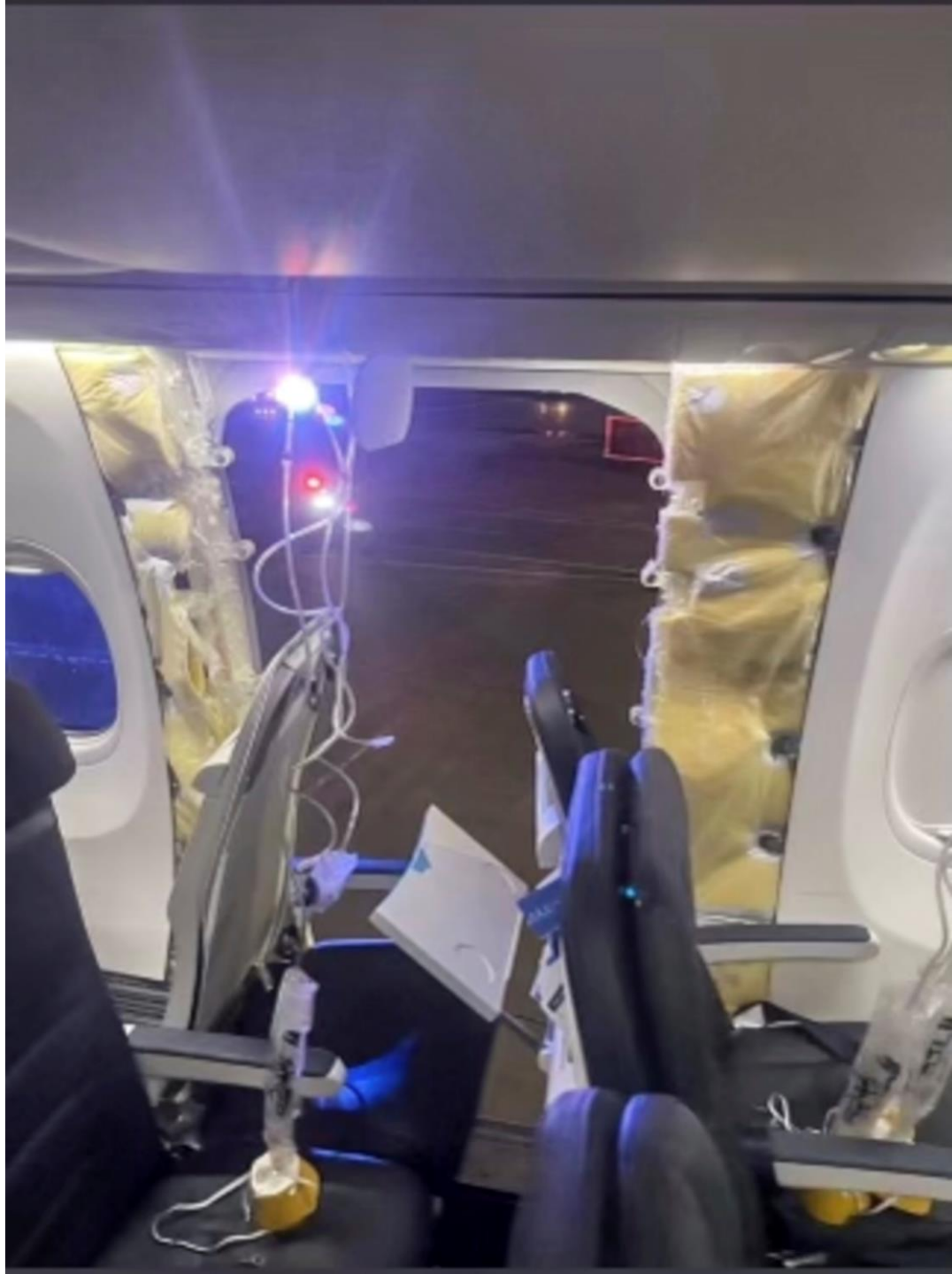
Artificial Intelligence (AI)	The ability of machines to perform tasks that would normally require human intelligence
Generative AI	AI that generates **new content** (language (text), images and code)
Machine Learning	Programming a model so that it “learns” from “training” data in order to make predictions when given new data (1)
Large Language Model	An AI trained on large quantities of written data (2)
Prompt Engineering	Optimizing a query given to LLMs in order to receive the intended response (3)
Chat Bot	LLM that simulates a human conversation

Quality and Safety remain a big problem…how can AI help?

Clinical Space: How can AI help clinicians and managers improve quality and safety in their daily work?

QI Space: How can AI help us be better equipped with QI knowledge, support us to be better QI coaches, QI implementers

Research Space: How can AI support better QI research and evaluation?



Using Generative AI in Clinical Practice

What Generative AI most useful for:

- Clinical problem solving/puzzles
- Curbside consults
- Technical help (calculations, creating apps)

“Do your own work, then use AI as a second set of eyes. Think of Generative AI as your assistant, not as a replacement of your primary responsibilities as a clinician”

https://www.youtube.com/watch?v=nSk8iE0hDH0

How widespread is Gen AI usage now?

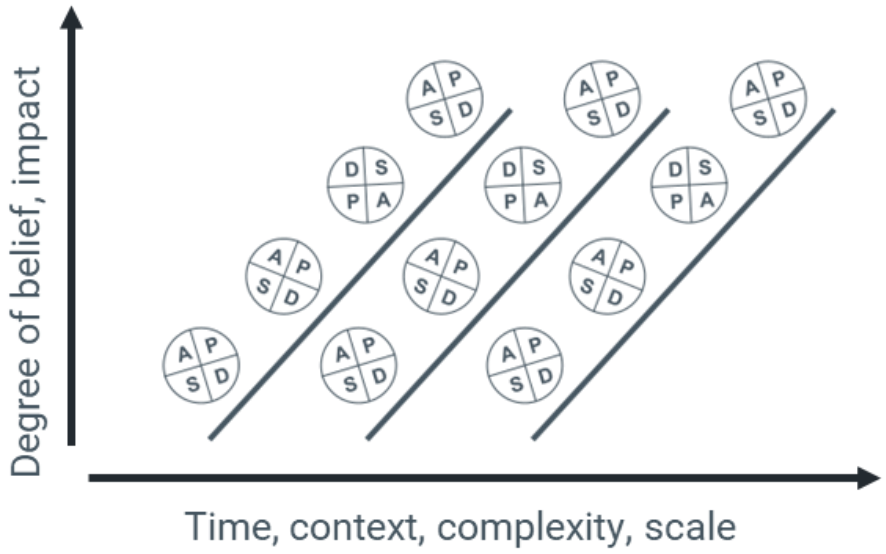
AMA Survey: 38% of **physicians** were using AI as of August 2023 (most common uses: creating discharge instructions, care plans, progress notes; documenting billing codes, medical charts, or notes; translation; assistive diagnosis)

KLAS Research: “….Although only 25% of interviewed respondents have implemented generative AI solutions, 58% say their **organization** is likely to implement or purchase a solution within the next year.”

Using Generative AI to support QI

Generative AI can already help with activities like:

- **Collecting data** (in real time) on the activities of service providers and service users (e.g., ambient listening, remote monitoring, documentation)
- **Conducting rapid analyses**, identifying problems, making suggestions
- **Providing suggestions** for core QI knowledge needs (e.g. change packages, driver diagrams)
- **Providing content for QI planning** (e.g. learning sessions, workshops)



Insights

5 Takeaways from a Discussion on Generative AI and QI

January 19, 2024

By Gareth S. Kantor, Marina Renton, Jeffrey Rakover, and Pierre M. Barker

https://www.ihi.org/insights/5-takeaways-discussion-generative-ai-and-qi

IHI Webinar January 2024 - 300 attendees

Current usage :

35% using AI to assist with quality work

- Brainstorming changes - 25%
- Analyze problems - 16%
- Building solutions – 16%
- Others using for clinical support (data management, clinical charting, research and writing, translation, content creation,

Concerns:

- Security
- Accuracy (vs hallucinations)
- Bias in AI algorithms- inequitable solutions responses/recommendations
- Outdated information.

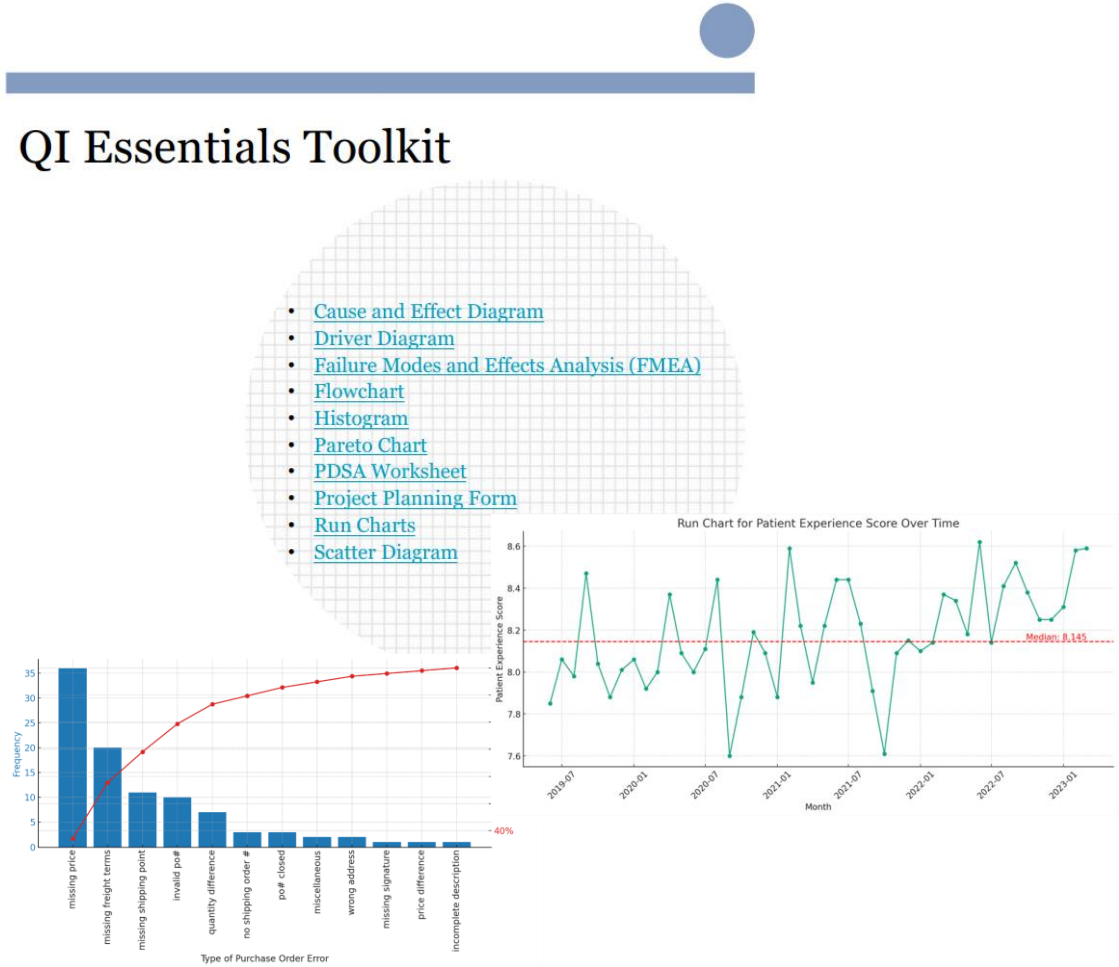
IHI 90-Day Research Cycle: How AI Might Facilitate QI?

LLMs

- multiple use cases for QI
- Can facilitate most components of the *QI Essentials Toolkit* (e.g., run & SPC charts, pareto analyses, PDSA ideas
- Can assist with graphing, image creation, and data analysis.

But…

- Requires AI training
- Many functions yet ready for broad usage



For further info see IHI webinar series, blogs on AI meets QI (https://www.ihi.org/insights/5-takeaways-discussion-generative-ai-and-qi)

Prompting AI to support QI leaders, teachers: e.g. Getting information to prepare for a BTS

- *Please assume the role of a quality improvement professional who is very knowledgeable about quality improvement methods.*
- *You are leading a new project to improve diabetes control in your type 2 diabetic population in a US-based primary care clinic that is a satellite site of an academic medical center with advanced specialist care.*
- *Create a driver diagram which includes the primary drivers of improved care, resulting in a decrease in average HbA1c of the clinic's diabetic population.*

AI support for QI leaders, teachers: Getting help with planning LS1

- *I am bringing in 20 teams to start an IHI Breakthrough Series Collaborative on improving diabetes care in the United States primary care setting.*
- *The purpose of the meeting is for participants to build trust within and across teams, understand the latest clinical evidence for diabetes control, understand the basics of QI methods, map the care pathways for their patients, set aims, and plan their first PDSA cycle.*
- *Please suggest an agenda for a 2-day in-person meeting.*

Using AI to help collect, synthesize and re-present data for Learning

e.g. Failure to rescue in low resource settings

AI Support for Data for Learning: The Future

The Problem:

- Data collection for QI and QC is very challenging in LMICs
- No EMRs – mostly manual recording and paper display of data
- Minimal data collection/synthesis support

What if….AI could listen, record, synthesize, graph progress on steps of monitoring and care?

1.

Risk Assessment for every surgical patient before surgery.

2.

Recording Vital signs

Visual Management Boards

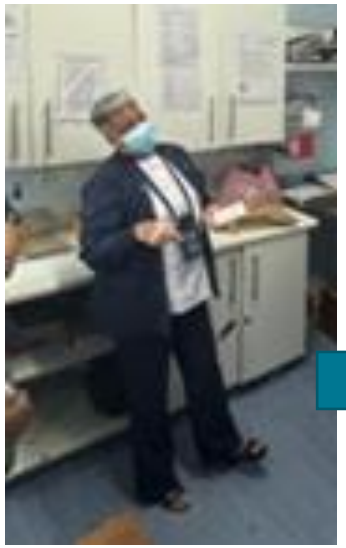
Huddles

3.

Rapid Communication and Response

What if….AI could listen, record, synthesize, graph progress on steps of monitoring and care?

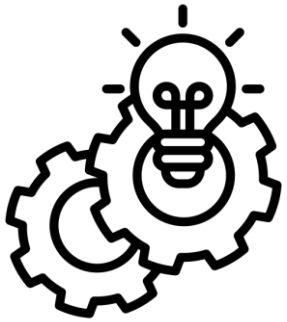
Learning loop



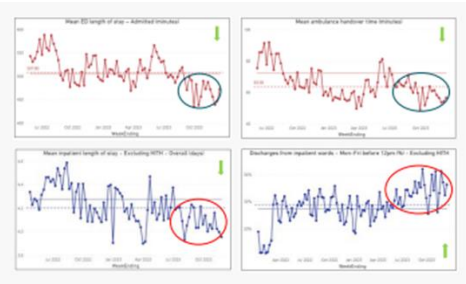
Guided script for huddle provides data on care pathway

Records, then transmits data verbalized from huddles

De-codes and Synthesizes



Report Generation



A Tentative Conclusion

- LLMs offer a powerful tool to support QI analysis.

  They can support generating visuals, surfacing change ideas, and analyzing data (all very rapidly - increasing productivity and scope for QI work).

- Can be used as an assistant for our work, not to replace our work
- However, they are not 100% reliable. Expect errors.
- Currently, these tools will likely be most useful to individuals who already have at least a moderate level of QI knowledge, as they can develop appropriate prompts and identify errors.

aqua
Shape Change Inspire Quality Transform Care

Can developmental evaluation realise the promise of AI in improving patient experience?

Ruth Yates, Advancing Quality Alliance, England

Declaration of interest

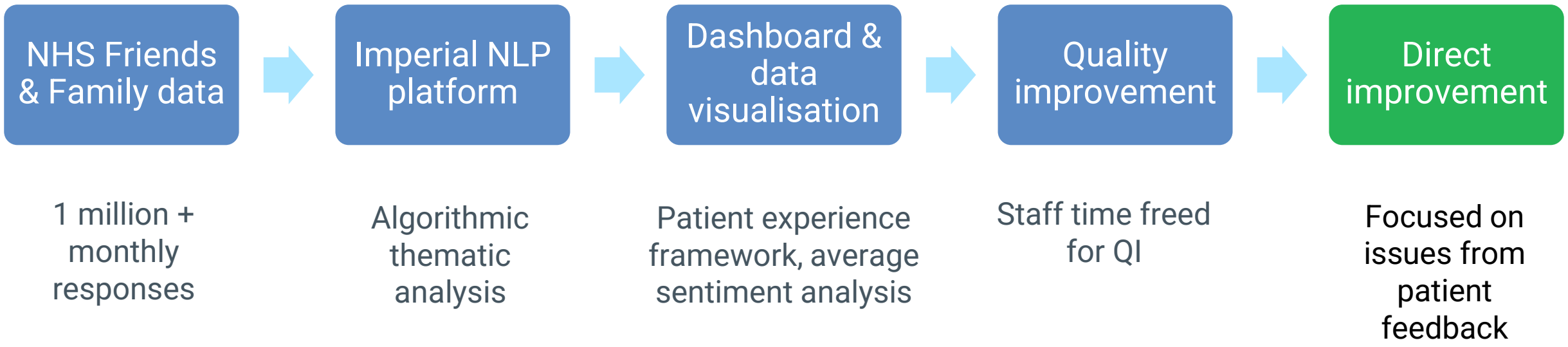
- Ruth Yates is employed by Aqua; part of the NHS
- The work described was funded by the Health Foundation as part of the scale, spread and embed programme
- We have no further declarations to make

Objectives

- Understand the aims of Imperial College's natural language processing model
- Build awareness of formative/developmental evaluation principles and flexible design
- Explore potential role of developmental evaluation in rapid development and implementation of complex technical and quality improvement initiatives

The Imperial NLP model

A language analysis toolkit to **visualise patient experience** data. Helps frontline staff **drive improvement**. Embedded evaluation, flexible design and **sustainable change**.



Participation

Phase I

- Oxleas NHS Foundation Trust
- Oxford University Hospitals NHS Foundation Trust
- Lancashire Teaching Hospitals NHS Foundation Trust

Phase 2

- University Hospital Southampton NHS Foundation Trust
- Humber Teaching NHS Foundation Trust
- Maidstone and Tunbridge Wells NHS Trust
- Great Ormond Street Hospital for Children NHS Foundation Trust
- Lancashire & South Cumbria NHS Foundation Trust
- Northern Care Alliance NHS Group

Putting this into practice

Dashboard **co-design** with frontline staff. Peer learning, public and patient involvement, including **lived experience** groups. QI opportunities identified, projects developed and tested. Tests of **sustainability**: 30/60/90 days. Improved **integration**, less silo working. Implementation toolkit.

The switch from formative to developmental evaluation approach

Formative evaluation has a **rapid-cycle design** to provide regular feedback to enable the development of **components of the intervention** and implementation and address challenges as they are encountered.

Developmental evaluation is **innovative**, adaptable, dynamic and **improvement-focused**. It can accommodate changes to design, implementation and outcomes. Real-time **feedback**, continuous loop. **Quick iterations**, tracking developments, surfacing issues, data testing.

Key questions: Was the process **scale-able**? What helped or hindered **implementation**? What helped or hindered **sustainability**?

Implementing, evaluating, adapting

Original design

		Degree of Intervention		
		Low	Medium	High
Engagement score	Low	3	3	3
	Medium	3	3	3
	High	3	3	3

Table 2 This matrix provides a visualisation of the overall allocation of Trusts against degree of intervention based on their individual engagement scores.

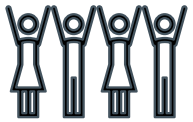
Adapted design

- Fewer than anticipated number of Trusts
- Overlap of phases one and two
- Transition from formative to developmental evaluation
- Less focus on QI intervention
- More focus on technical capacity and capability
- More focus on capturing use of Patient Experience in design and implementation

Real world implementation issues

Covid-19; capacity constraints; ethics and data sharing; third party suppliers

Scale, spread and embed evaluation: implementation adaptation

Cohort	# of Trusts	Implemented NLP platform	Deployed dashboard	QI activities using data
 ‘Leading Lights’	X3	✓	✓	✓
 ‘Nearly there?’	X3	✓	✓	
 ‘Keep going’	X3	✓		

Key learning

Barriers:

Technical capability and capacity of Trust teams

Facilitators:

Support from project team

Senior buy-in / leadership

Cross domain working

Adapted outcomes

Implementation manual being used by nine additional trusts

Coding pack with detailed guidance and template and bag of words approach

Development of specialist expertise in Trusts

Increased use of free text FFT data

Shared learning across Trusts / Community of Practice

Trust dashboard examples

Scale
Spread
Embed

At a glance, dashboards show frontline staff what areas of patient experience they are doing well in and let to filter comments specific to that theme. Data can be reviewed at team, division, and Trust level.

Imperial College Healthcare NHS Trust

aqua Shape Change Inspire Quality Transform Care

NIHR | Imperial Biomedical Research Centre

The Health Foundation

Imperial College London

Example QI changes made by Trusts

Scale
Spread
Embed

NHS Lancashire Teaching Hospitals NHS Foundation Trust

Information, Communication, Education

What did data say?
Patients confused by different versions of post discharge wound care.

Changes tested
Shared wound care policy via team huddles to standardise care.

Results of change
Policy reviewed and circulated to all staff; ensuring they have the same information. Monitor feedback via NLP and ask patients on the ward.

NHS Humber Teaching NHS Foundation Trust

Co-ordination & integration of care

What did data say?
Telephone booking system ineffective and led to issues with cancellations and rebooking appointments.

Changes tested
Implemented improved patient communication offering rebooking links with cancellation. Used to submit a business case for a new booking system.

Results of change
New appointment booking system procured.

NHS Maidstone and Tunbridge Wells NHS Trust

Staff motivation and wellbeing

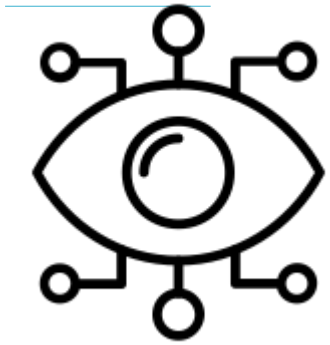
What did data say?
The dashboard provided staff with greater access to positive feedback.

Changes tested
Positive feedback was added to the newsletter, and staff were given the chance to review the tone of the newsletter to make it more positive.

Results of change
Staff have fed back how much they benefit from hearing positive feedback via the newsletter.

What did we learn about successfully implementing AI technology in this project?

Scale
Spread
Embed

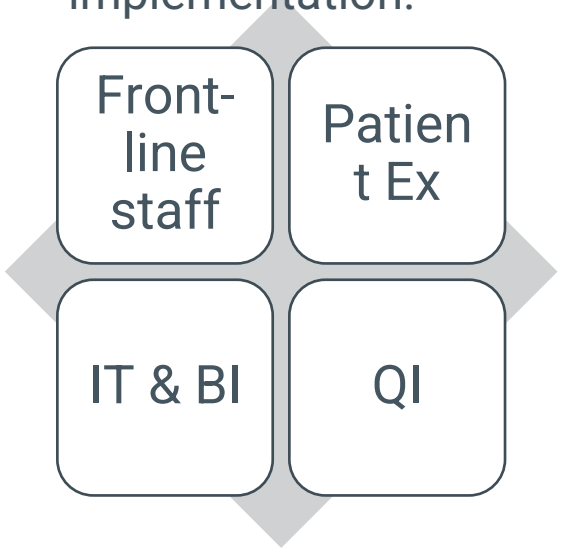


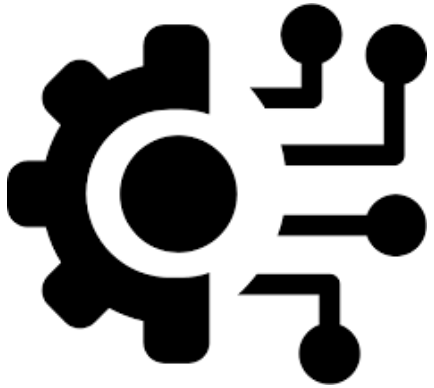
Exec Sponsorship

Leadership need a clear vision of how this will benefit the organisation accompanied by a willingness to put resource into implementation and specialist capability building.

Multi-disciplinary working

The most successful teams worked together to problem solve implementation.



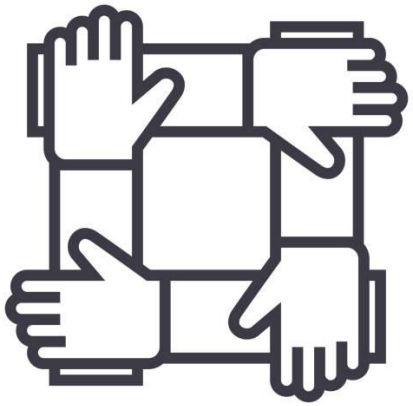


Co-production of new tools

Technical meetings highlighted bespoke needs around sentencing, multi-tagging, and redaction. Collaboratively developed, tested and shared by Trusts.

Peer to peer support

Connections between Trusts to develop technical skills, establish a trusted community to learn from early adopters and share resources.



Imperial College Healthcare NHS Trust
aqua Shape Change Inspire Quality Transform Care
NIHR | Imperial Biomedical Research Centre
The Health Foundation
Imperial College London

Further work by Imperial team and how to get involved

Imperial have created a tool that can be:

- ✓ Implemented by health and social care organisations using an **evidence-based real-world tested implementation manual** that contains case studies and step-by-step guidance.
- ✓ **Localised** using easy-to-use accompanying software to support algorithm retraining and ensure algorithm accuracy.
- ✓ Used with **peer-to-peer support** from organisations that are implementing the tool through our online community of practice.
- ✓ Used as a **framework for implementing similar artificial intelligence technologies** in health and social care settings to support operational efficiency and service improvements.

Imperial College Healthcare NHS Trust

aqua Shape Change Inspire Quality Transform Care

NIHR | Imperial Biomedical Research Centre

The Health Foundation

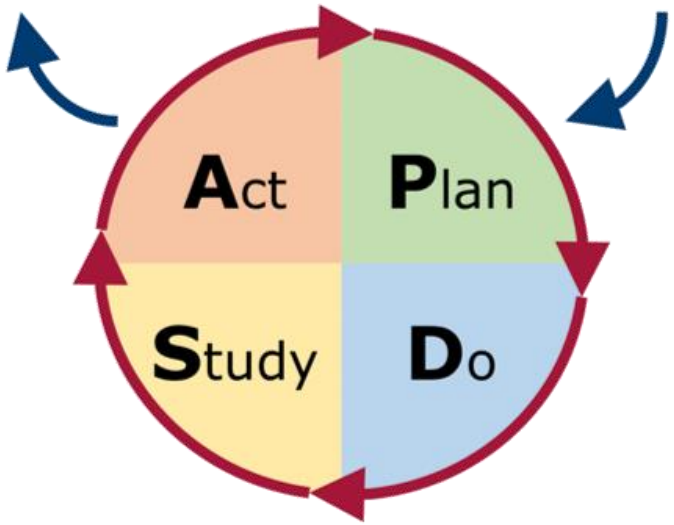
Imperial College London

Model for Improvement

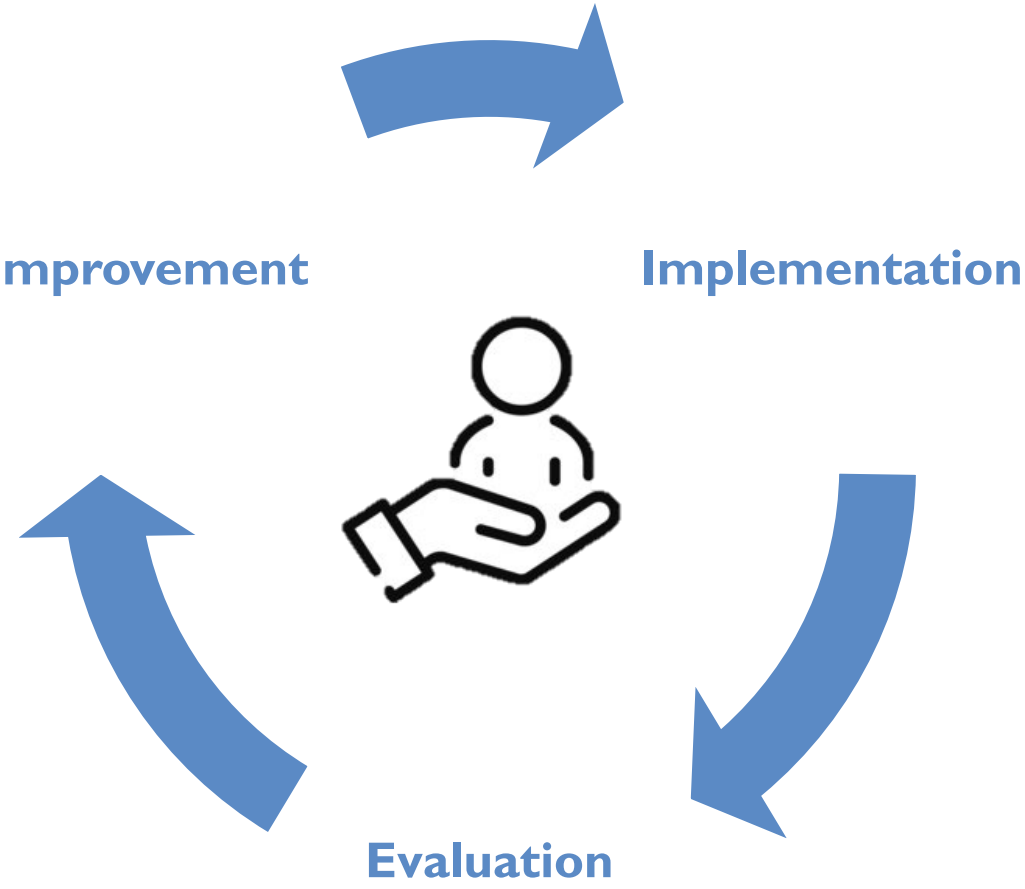
What are we trying to accomplish?

How will we know that a change is an improvement?

What change can we make that will result in improvement?



Aqua's improvement focused, evaluation-based implementation of technology



aqua

Shape Change Inspire Quality Transform Care

For more information about Aqua and the work we do please contact Ruth Yates (**ruth.yates@aqua.nhs.uk**)

For more information about the Imperial work please contact Sarindi Aryasinghe (**s.aryasinghe@imperial.ac.uk**)

@Aqua_NHS Advancing Quality Alliance

3rd Floor, Crossgate House, Cross Street, Sale, M33 7FT
Call: 0161 206 8938
Email: enquiries@aqua.nhs.uk
www.aqua.nhs.uk