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24-ICIT: Paper # 6-2DK

6-8 Feb 2025 hosted by the **Gracia Christian College (GCC)**
At the Regal Riverside Hotel, Shatin, HKSAR, China (www.hk5sa.com/icit)

The Role of AI in Transforming Healthcare Quality & Patient Safety

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Since 2011 she is a project coordinator And supervisor at Linnaeus University Sweden. She is teaching and making research on Innovation, Product and Service Development; Extra legal obligations and ethics Quality control 5Qs model,Health care quality assurance Patient safety,

ICIT + Mosad & Valentina

6-8/2/2025 hosted by GCC, Paper #6-2DK

Gratia Christian College (GCC) SKM-MTR Exit-C, Kowloon







1. AIM

This presentation present and discuss the Role of AI in Transforming Healthcare Quality and Patient Safety for **better life quality**.



2. Overview

1. What is Artificial Intelligence (AI)?
2. What is Patient Safety
3. Why AI in Healthcare?
4. AI in Enhancing Healthcare Quality
5. AI and Patient Safety
6. Challenges and Ethical Considerations
7. Case Studies and Success Stories
8. Future Directions
9. Conclusion
10. 10. Q&A Slide

As you/we all already got very informative and interesting knowledge about AI role in Medicine (prof. Fernando Gonzalez (thursday & Linda Forbes & John Hamilton, Friday) we found that our presentation would not make any significant contribution but repetition of what we already knew. Thus, **we changed our mind and focus to shed more light about the real need of patients....**

The role of IA in Improving quality of life or

**Prevent patient from the death by doctors and
healthcare system**

Medical Error /Harm

Thomas L. et al. (Michigan State University- February 12, 2024).

Medical errors is recently recognized as a serious public health problem.

ME is reported as **the third leading cause of death** in the US.

Approximately **400,000** hospitalized patients experience some preventable harm each year.

Another study estimated that **>200,000** patient deaths each year were due to preventable medical errors.

Medical errors have a **high cost** the healthcare system \$20-45 billion each year.

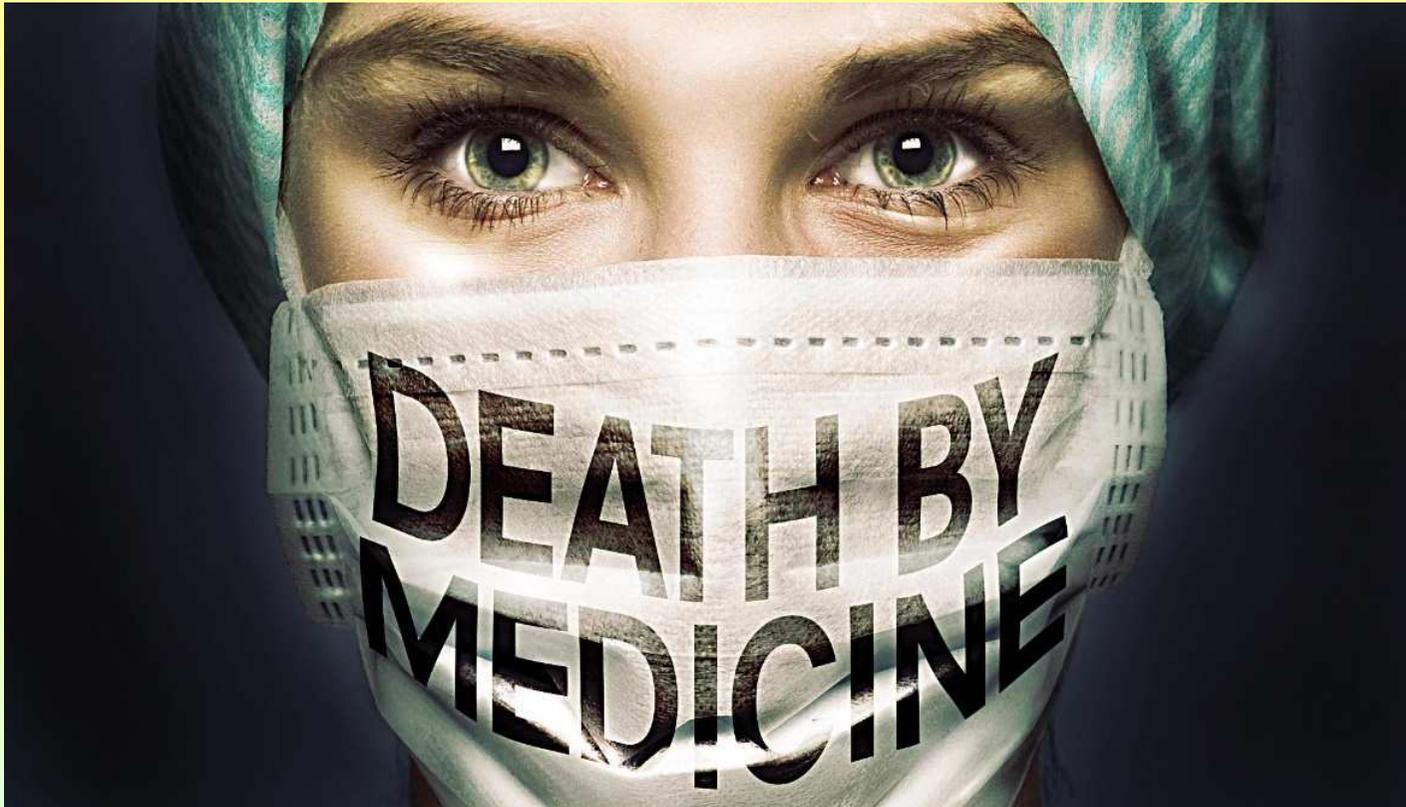
the More Terrible is that:

Doctors May Be Third Leading Cause of Death! ”

in the US, Canada and other countries Causing 250,000 Deaths Every Year.

This data was published in Journal of the American Medical Association
AMA.

The author is Dr. Barbara Starfield of the Johns Hopkins School of Public
Health and she describes how the US health care system may contribute to
poor health.



Death by medicine or death by medicine performed by human.

Let us just watch 3 of this 8 minutes video...about chronic diseases & medical errors

[Medical Errors Are Killing Us | Theresa Sabo | TEDxStanleyPark](#) (CANADA)

<https://www.youtube.com/watch?v=3GKU03LU6ck> (usa) (1-4 minutes)

**diagnostic errors,
medication errors,
surgical errors,
equipment failures,
hospital- infections, and
communication failures.**

Errors vs violations:

error = unintentional action

- Example of **incorrectly executed plans** as a result of attention failure: an anaesthetist wants to adjust the airflow to a patient but turns the wrong dial.
- Example of **a plan that is not executed**: a GP forgets to issue her promised prescription for a patient after finishing her other home visits.
- Example of the **wrong plan**: initial misdiagnosis and wrong treatment.

violation = deliberate action, including negligence , medical malpractice.

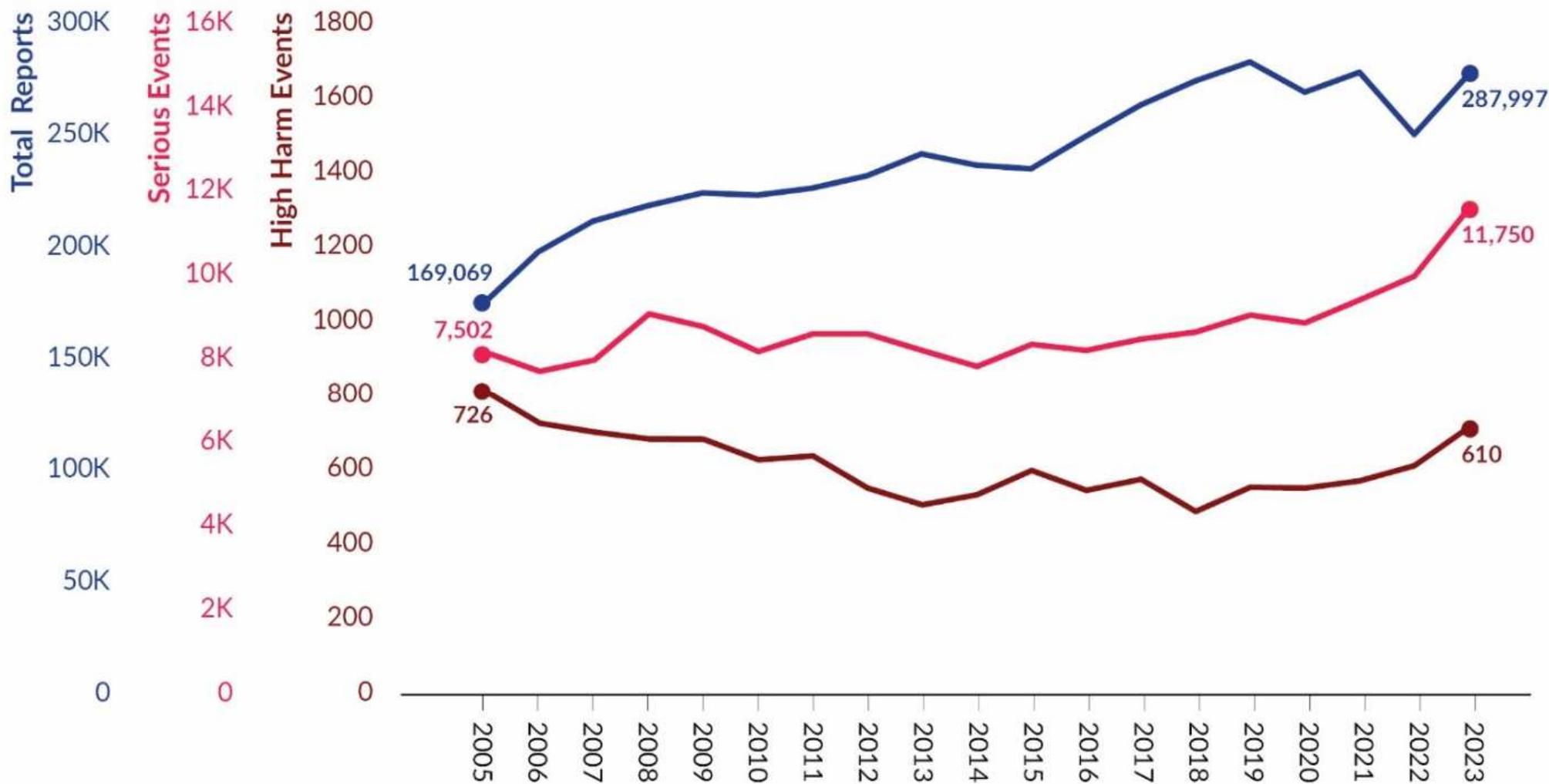
- Example: deliberately inadequate record-keeping because you are “too busy”
- Deviation from accepted standards of practice (by action or omission)

**remember that in 2014 I published a paper in a medical journal
about the medial errors.**

**After 10 years, i.e. In 2023, 287,997 number of reported medical
errors in USA, which
is an increase by 20-25% from 2014 .**

**Serious harm increased by 20.26%
High harm events increased by 25.0%**

**Now we are wondering about the real role of AI in preventing the deaths or
improving the patient safety???**



SILENT IS NOT AN OPTION

<https://www.youtube.com/watch?v=xzY8hNw7JmE>

[Can AI Catch What Doctors Miss? | Eric Topol | TED – YouTube](#)

What is AI?

most simple definition of AI is that :

Artificial Intelligence refers to systems or machines that mimic human intelligence to perform tasks, improve over time, and adapt based on data.

Or

Artificial Intelligence (AI) is the simulation of human intelligence by machines, especially computer systems. AI enables machines to perform tasks like learning, reasoning, problem-solving, and decision-making, often mimicking human behavior.

little more complex definition

refers to the simulation of human intelligence in machines that are programmed to think and learn.

In the context of healthcare, AI automation involves using these intelligent systems to perform **tasks that typically require human intervention**. These tasks can be:

Data analysis

Diagnostics

Treatment

Recommendations & Patient monitoring.

short: AI in healthcare is about machine learning, natural language processing, and robotics to enhance **efficiency, accuracy, and personalized care.**

ML & DL

Machine Learning (ML)

Example: Predicting diabetes.

A doctor gives the model data like age, weight, and blood sugar levels. The model uses this information to predict if a patient might have diabetes.

Deep Learning (DL)

Example: Finding tumors in scans

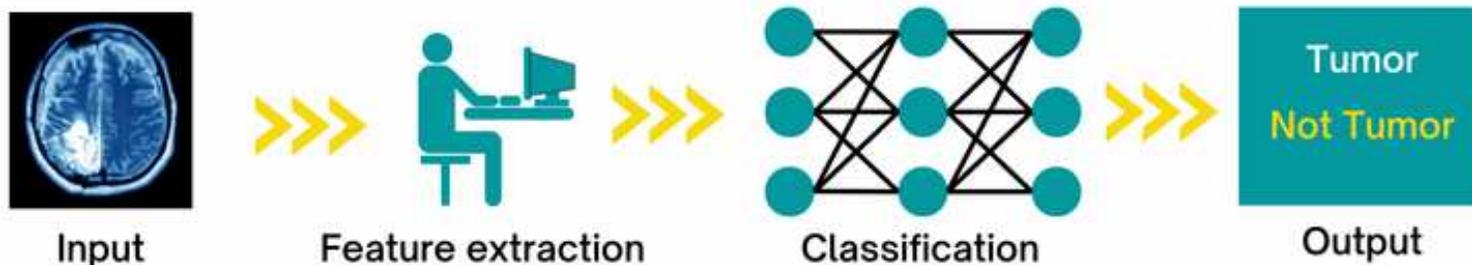
The model looks directly at raw MRI images and learns to spot tumors without a doctor telling it what to look for.

Key Difference:

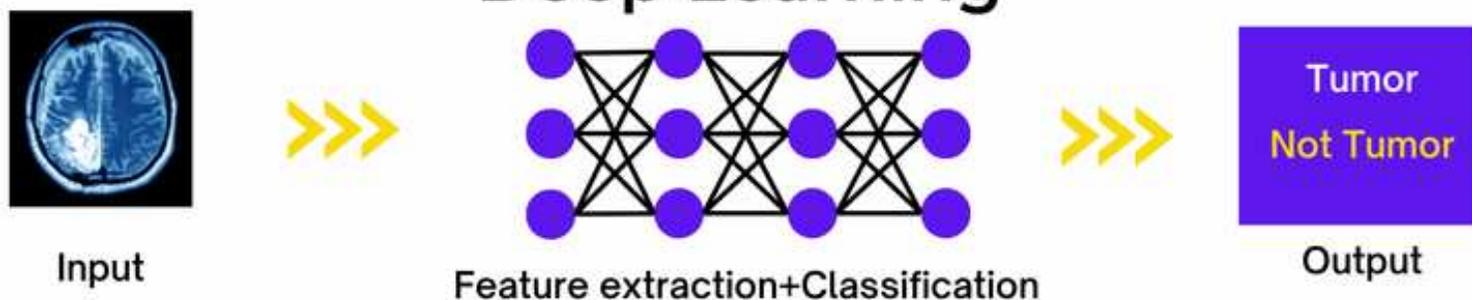
ML needs humans to decide which data to use.

DL figures out important features directly from raw data.

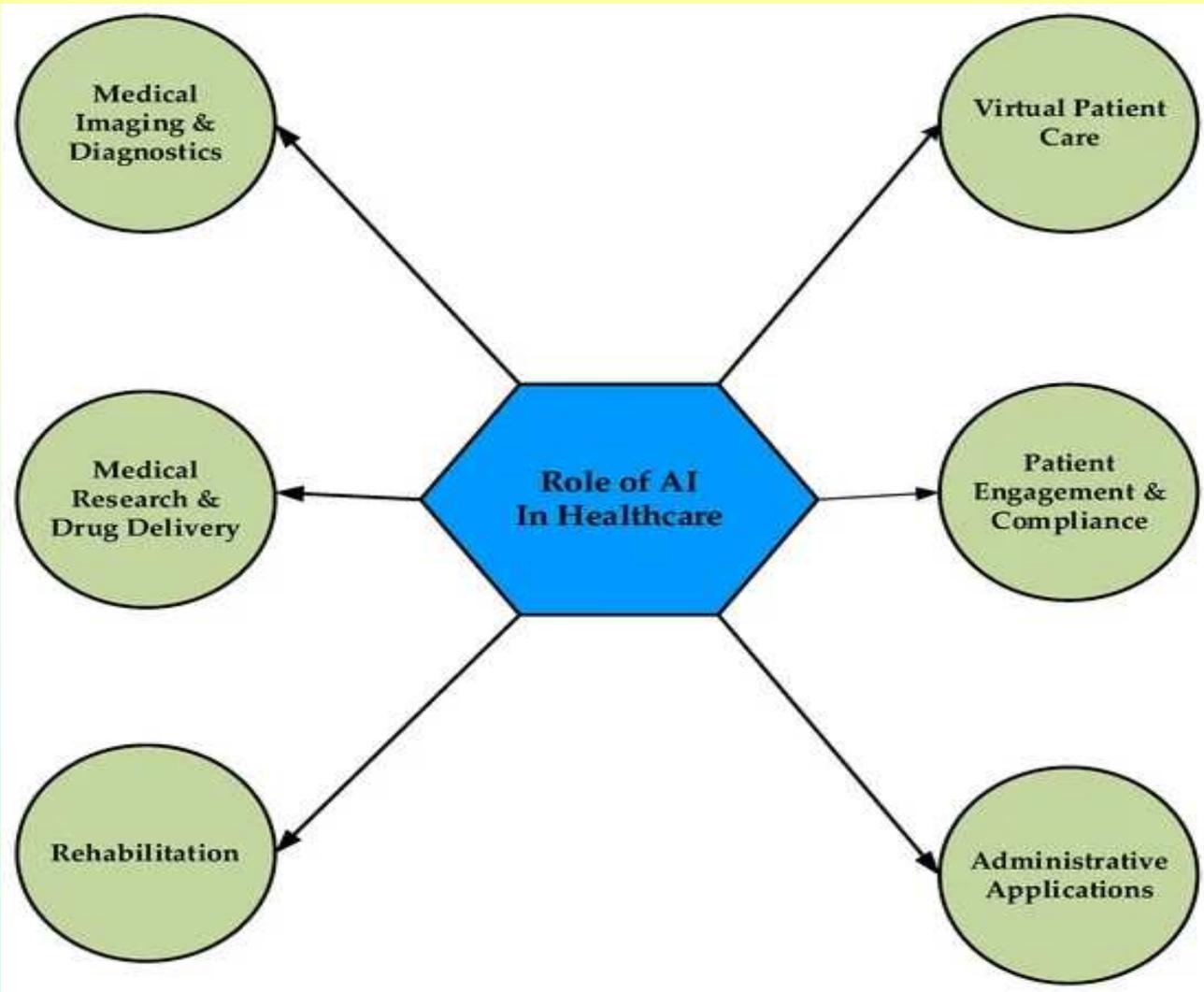
Machine Learning



Deep Learning

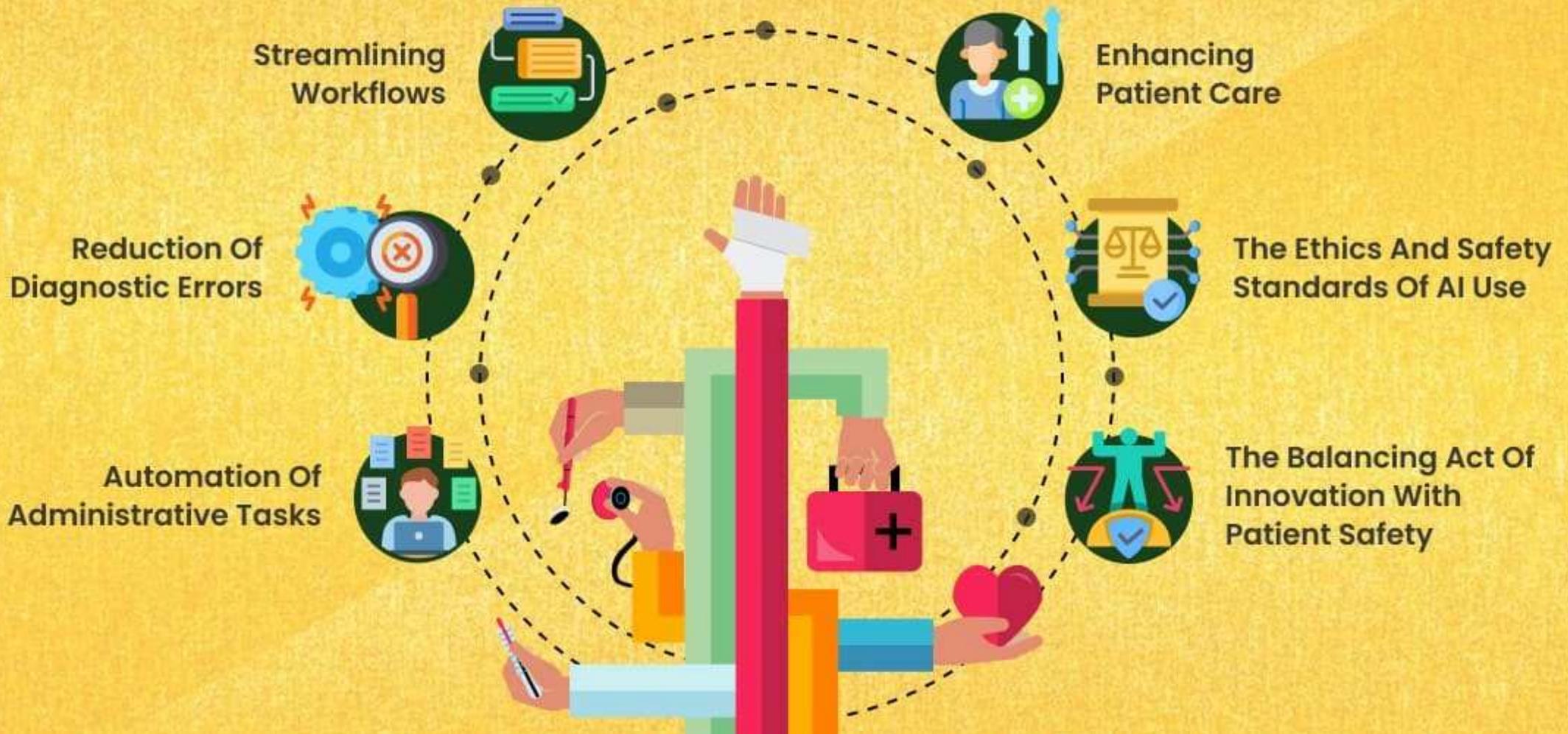


4. This presentation adopts The following Integrative Model for AI role in health car (AI-RHC)



Transforming Healthcare

The Integration Of AI And Patient Care



AI can help prevent medical errors and patient harm through several mechanisms:

1. Improved Diagnosis

- **Early Detection:** AI algorithms analyze medical data (e.g., imaging, lab results) to detect diseases earlier and more accurately, reducing misdiagnoses.
- **Decision Support:** AI provides clinicians with recommendations or second opinions based on vast medical knowledge, minimizing human errors.

2. Error Reduction in Treatment

- **Personalized Medicine:** AI tailors treatments to individual patient needs, improving effectiveness and reducing adverse effects.
- **Medication Safety:** AI can identify potential drug interactions, incorrect dosages, or allergies before prescriptions are issued.

Monitoring and Alerts

Real-time Monitoring: AI systems monitor vital signs and patient data in real time, alerting healthcare providers to warning signs of complications.

Predictive Analytics: AI predicts patient deterioration, enabling timely interventions to prevent harm.

Workflow Optimization

Automation: AI automates repetitive tasks, reducing fatigue-related errors by healthcare providers.

Scheduling and Resource Management: AI optimizes staff scheduling and patient flow to prevent crowding and resource shortages.

Error Detection and Learning

Analyzing Records: AI reviews medical records to identify patterns of errors, helping institutions improve practices and prevent repeat mistakes.

Technical Training: AI-based simulations help train healthcare providers in complex scenarios, reducing mistakes in real-world practice.

Integrating AI into healthcare, systems can enhance accuracy, efficiency, and safety, ultimately reducing risks to patients.

Technologies for Prevention

Machine Learning (ML):

Identifies patterns and predicts outcomes based on patient data.

Examples: Predicting disease progression or detecting anomalies in medical imaging.

Natural Language Processing (NLP):

Extracts information from unstructured clinical notes, prescriptions, and reports to flag inconsistencies or errors.

Computer Vision:

Analyzes medical images like X-rays, CT scans, and MRIs to detect abnormalities such as tumors or fractures.

4. **Robotic Process Automation (RPA):**

- ❑ Automates repetitive administrative tasks, reducing human errors in scheduling, billing, and documentation.

5. **Predictive Analytics:**

- ❑ Combines historical and real-time patient data to predict risks like sepsis, heart failure, or surgical complications.

6. **Decision Support Systems:**

- ❑ Provides clinicians with evidence-based recommendations, helping them choose the best course of action.

Devices and Machines to early detect diseases

Diagnostic Tools with AI Integration:

AI Imaging Systems:

Devices like GE Healthcare's AI-enabled ultrasound or Siemens' CT scanners analyze images for diagnostic precision.

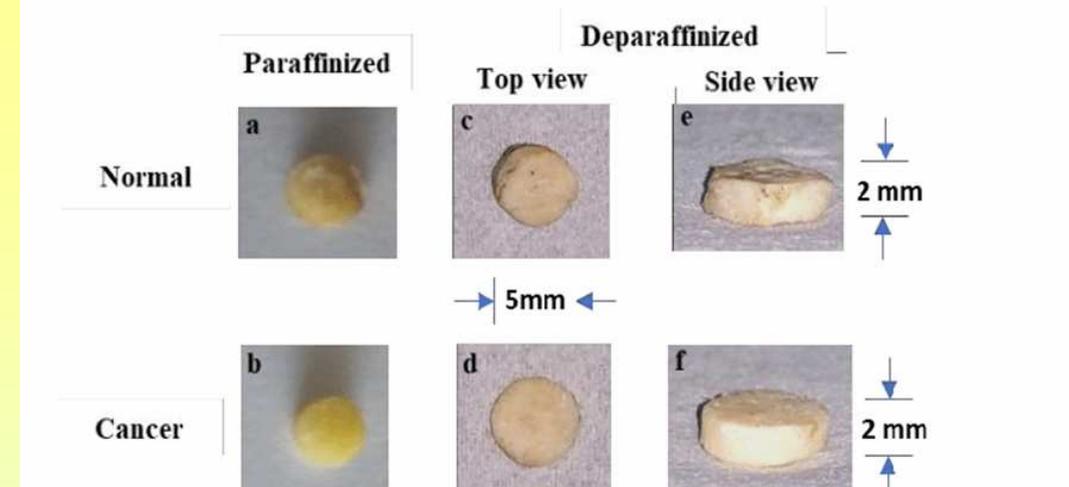
Pathology Analysis Systems:

Automate the examination of biopsy samples to detect cancer or infections.

<https://www.youtube.com/watch?v=fNZkiJ17B4I>

[YouTube](#)

IT + Mosad & Valentina



Breast biopsy tissue. (a) Normal paraffinized tissue, (b) Cancer paraffinized tissue, (c-d) Top view of normal and cancerous tissue after deparaffinization process, and (e-f) Side view of normal and cancerous tissue after deparaffinization process.

<https://youtu.be/jNWNDBEE5Q0?si=HE074GtZXmohjzdT>

Artificial intelligence is offering hope to women suffering from breast cancer. Researchers in Sweden found AI appears to be able to find some breast cancers earlier than human doctors, and in some cases, even before the disease is one of the leading causes of death in the world.

Could that be about to change?

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2. Surgical Robots:

Da Vinci Surgical System: Uses AI for precision in surgeries, minimizing **human errors**.

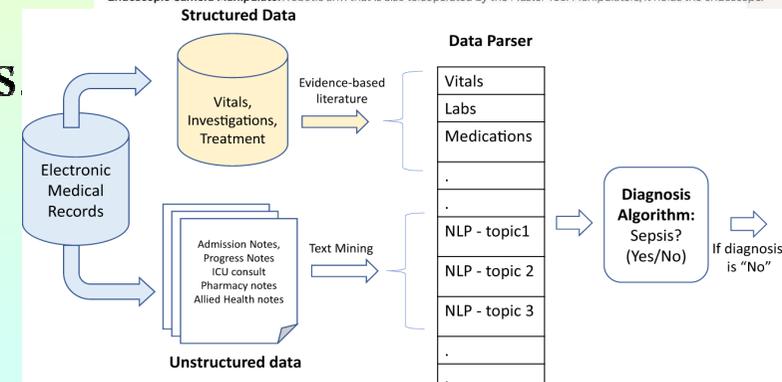
Navigation Integrated Systems **with Deep Learning:** AI-enabled tools guide surgeons during complex Procedures to minimize the human or medical errors.



Predictive and Early Warning Systems:

Sepsis Detection Algorithms: Embedded in EHR systems, they monitor patient data for early signs of sepsis.

AI-Based Risk Scoring Tools: Predict surgical complications or hospital readmissions.



Artificial intelligence in sepsis prediction and diagnosis using

Examples of the effective AI in saving lives

[Can AI Catch What Doctors Miss? | Eric Topol | TED – YouTube](#)

1-8 minutes

integrating AI technologies and devices, healthcare systems can significantly

- reduce errors,
- improve quality and safety
- enhance efficiency,
- ensure better patient outcomes
- & quality of life.

Comparing error rates between artificial intelligence (AI) systems and human doctors in medical diagnostics reveals notable insights:

Human Doctors' Error Rates:

- Studies indicate that diagnostic errors by human physicians occur in approximately 10–20% of cases
- Other studies argue that human/doctors error rates have been observed to reach up to 44%. [Frontiers](#)

AI Systems' Performance:

- Research demonstrates that AI systems can achieve diagnostic **accuracy** comparable to or exceeding that of human specialists. For instance:
 - **In dermatology**, an AI system attained an accuracy of 72.1% ($\pm 0.9\%$), while dermatologists achieved 65.8%

Finding: AI's Impact on Quality of Life

AI revolutionizing Chronic Disease Management



○ **Chronic Disease Management:**

- Tools for diabetes, hypertension, and other conditions
- AI-driven apps for lifestyle monitoring and coaching.

○ **Mental Health:**

- AI chatbots providing initial support.
- Predictive tools for suicide prevention or stress monitoring.

○ **Accessibility:**

- AI aiding people with disabilities

○ **Telemedicine:**

- AI-enhanced remote consultations for underserved populations.

low AI can improve chronic disease management, hence quality of life.

Early Detection and Predictive Analytics

AI's ability to analyze extensive datasets has led to major advancements in the early detection of chronic diseases. Allowing timely medical intervention

Personalized Treatment Plans

AI integrating a person's medical history, genetic factors, and lifestyle. Machine learning algorithms help optimize treatment plans, including medication. (**apps and devices**)

Consider a patient with diabetes: AI tools can analyze blood sugar levels, diet, and physical activity to create a treatment plan that adjusts in real-time. Such individualized strategies optimize blood sugar control and reduce the risk of complications, leading to better long-term outcomes.

. Continuous Monitoring Through Wearable Technologies

Wearable AI devices are enabling continuous, real-time monitoring of vital signs such as heart rate, blood glucose, and oxygen levels. These devices collect and analyze data, providing timely alerts to both patients and healthcare providers.

For example, patients with chronic respiratory diseases can benefit from wearables that monitor breathing patterns. AI algorithms can detect early signs of worsening symptoms, enabling timely intervention and preventing hospitalizations.

. Virtual Health Assistants for Ongoing Support

AI-driven virtual health assistants, offering reminders for medications, suggesting lifestyle changes, and providing personalized health information. For instance, an AI-based assistant can remind hypertensive patients to take their medication, suggest stress-reducing exercises, and provide dietary advice.

. Emotional and Behavioral Support

Chronic illnesses can significantly affect mental and emotional well-being by providing emotional and behavioral support through digital platforms. Machine learning algorithms can analyze patient data to offer personalized mental health support, mood monitoring, and mindfulness exercises, all of which help improve psychological resilience.

For example, a patient dealing with the emotional challenges of diabetes management can use an AI app that offers coping strategies, reinforces positive behaviors, and connects them with a community of peers facing similar challenges. These holistic interventions are crucial for keeping patients motivated and engaged in their care.

FINDING: Challenges and Ethical Considerations

Data Privacy and Security:

- Risks of patient data breaches.

Bias in AI Algorithms:

- Addressing disparities in outcomes for diverse populations.

Regulatory and Legal Hurdles:

- Ensuring safety and effectiveness of AI tools.

Human Oversight:

- Balancing AI with the irreplaceable role of healthcare professionals

SUMMARY OF FINDINGS

Artificial Intelligence is revolutionizing healthcare by enhancing quality and ensuring patient safety.

Through predictive analytics, real-time decision support, and automation of routine tasks, AI empowers healthcare providers to offer precise diagnoses, personalized treatments, and proactive care.

While challenges like: ethical concerns, data security, & integration remain, the potential of AI to transform healthcare is undeniable.

By embracing innovation responsibly, AI can lead to **safer patient outcomes**, **improved operational efficiency**, and a **higher quality of life** for individuals worldwide.

AI accuracy

[Can AI Catch What Doctors Miss? | Eric Topol | TED – YouTube](#)

Minutes 2.5 – min 5.

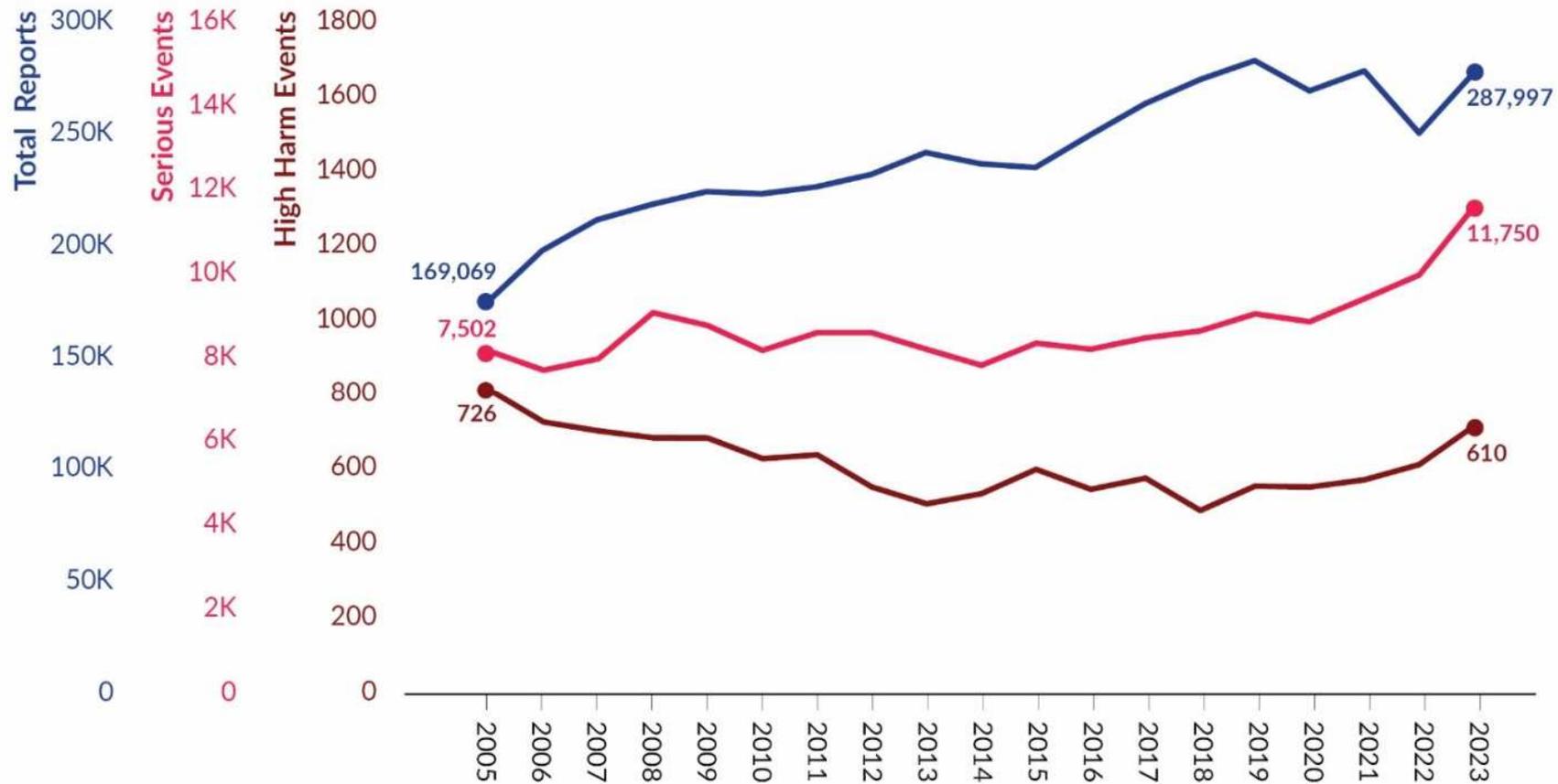
[Should AI be used in health care? Risks, regulations, ethics and benefits of AI in medicine – YouTube](#)

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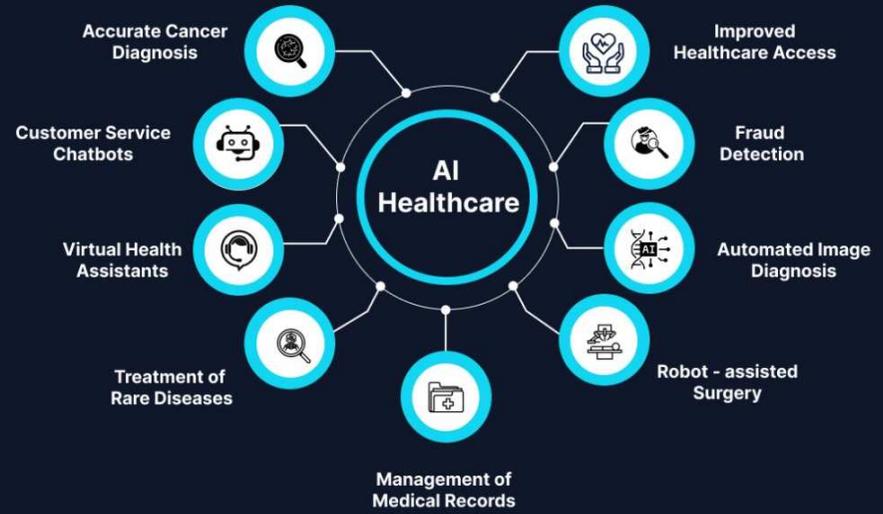
<https://www.youtube.com/watch?v=xzY8hNw7JmE>

Can AI Catch What Doctors Miss? | Eric Topol | TED – YouTube

Minutes 2.5 – min 5.



Role of AI in Healthcare



Source: <https://www.linkedin.com/pulse/ai-revolution-healthcare-artificial-intelligence-take-mbbs-mph-pqyuc/>



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3Q



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