Identifying the Deteriorating Patient Post Operatively through AI

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Learning Objectives

Participants will:

➤ Demonstrate an understanding of Artificial Intelligence (AI) and how it can assist in improving patient safety

➤ Analyse the criteria required to develop algorithms for an AI system

➤ Compare the use of algorithms and routine assessments in identifying deteriorating patients

➤ Explore other AI opportunities to improve patient safety

AI

➢AI works by developing mathematical algorithms that feed on data that has been carefully ordered and categorized

➢When humans embed known data into algorithms, computers can extract information and apply it to a problem.

➢In healthcare today, the most commonly used "AI" applications are algorithmic: evidence-based approaches programmed by researchers and clinicians

➢Using consensus algorithms from experts in the field, along with the data that a clinician enters into a medical record (i.e., a patient's age, genetics, cancer staging and associated medical problems), a computer can review dozens, sometimes hundreds, of established treatment alternatives and recommend the most appropriate combination of chemotherapy, immunotherapy or other treatments and drugs for a cancer patient.

Proof of Concept Deteriorating Patients

➢In 2018 Smart Dubai Government partnered with DHA to undertake a "proof of concept AI project"

➢The partnership utilized "big data" from DHA's EMR system together with the AI technical staff engaged by Smart Dubai, to identify if any "patterns" could be established/identified from our data

➢The decision from the DHA clinical staff was to try to identify deteriorating patients early and therefore potentially save lives

Why Deteriorating Patients?

Undiagnosed deteriorating patients are the biggest risk for any healthcare organization as outlined in many research papers internationally

Scope of Work

•	Built into Salama is the Medical Emergency Warning System (MEWS). This system only flags when vital signs fall outside normal parameters

•	This scope of work is designed to examine the MEWS scores as well as:

a.	Response times for intervention

b.	Patients specialty

c.	Any procedures taken

d.	Duration of stay

e.	Transfer out of ICU

•	The purpose is to see whether AI can identify and propose early interventions to save patients' lives

Scope of Work – Why Did We Choose?

➢Experienced health care professionals will have "gut feeling" about their patients

➢The signs and symptoms of patients may influence who you keep a "closer eye on" **BUT**

➢Prior experience will often influence a doctor/nurse to watch patients:
  ➢who have recently had a surgical procedure undertaken
  ➢are a recent transfer out of ICU
  ➢Come from a specific specialty

WHY???

Assumptions

➤The prediction depends on the accuracy of the data recorded

➤The model needs at least 3 historical data points

➤The model can predict if the patient's health will deteriorate within 5 future time periods.

➤The model will predict whether the patient's health will deteriorate (Binary – Yes/No), not the mews score.

➤MEWS [0, 1, 2] -> healthy

➤MEWS [3+] -> critical

Number of Patients in Each Department in Each Hospital.

Legend:
- DUBAI HOSPITAL
- HATTA HOSPITAL
- LATIFA WOMEN AND CHILDREN HOSPITAL
- RASHID HOSPITAL

Department	Dubai Hospital	Hatta Hospital	Latifa Women and Children Hospital	Rashid Hospital
Emergency Medicine	61	10	7	702
General Internal Medicine	327	128	0	281
Obstetrics and Gynecology	346	21	661	0
Intensive Care	67	15	13	67

A total of 4,563 Encounters

9
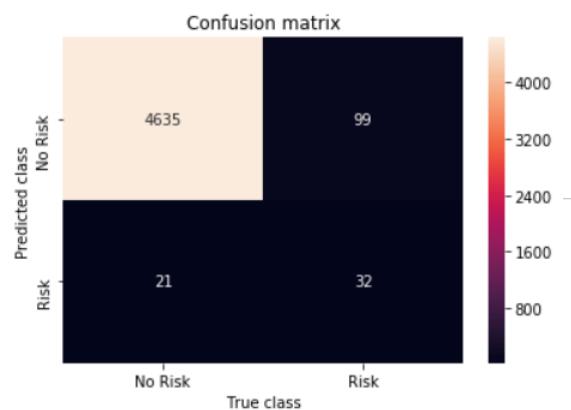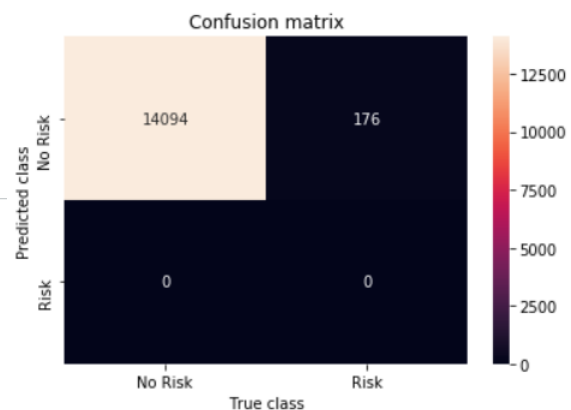
The results achieved for internal medicine were as good as expected, the model generalised well enough on the new hospital.

The other models don't have enough data to test on. Obstetrics and Gynaecology seem to have no risky sequences in their samples, ICU seem to only have risky sequences in their sample.
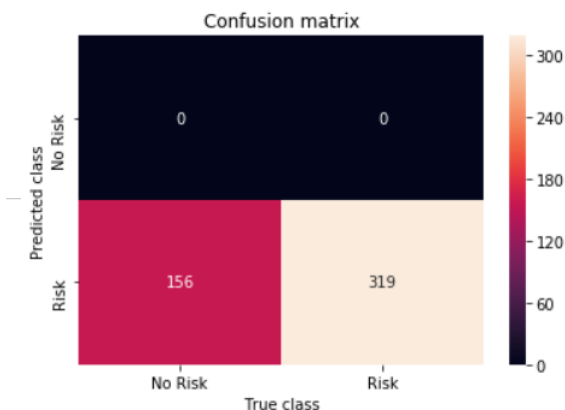
General Internal Medicine

Obstetric and Gynaecology

Intensive Care

	Rashid and Dubai	Hatta and Others
Accuracy	0.913	0.975

	Rashid and Dubai	Hatta and Others
Accuracy	0.987	0.988

	Rashid and Dubai	Hatta and Others
Accuracy	0.938	0.671

Big Data

➢ The reason this term is used, particularly in relation to AI, is because of huge of information that is reviewed and fed into the algorithm

➢ For this project approximately 2 million data points were examined

➢ This allows the machine to continually learn and improve the accuracy of the results.

➢ This is why false positives/negatives become less and less as more data is examined

Department		Dubai & Rashid		Other hospitals	
		% Time	% Total	% Time	% Total
Internal Medicine	Encounters	1,435		552	
	Healthy	93.6%	60%	97.2%	75.5%
	Unhealthy	6.4%	40%	2.8%	24.5%
	Model Accuracy	97.4%		98.8%	
Obstetrics and Gynaecology	Encounters	1,530		3,017	
	Healthy	98.6%	83%	98.3%	80%
	Unhealthy	1.4%	17%	1.7%	20%
	Model Accuracy	98.5%		98.2%	
ICU	Encounters	549		310	
	Healthy	28.6%	1%	61.1%	17%
	Unhealthy	71.4%	99%	38.9%	83%
	Model Accuracy	90.2%		85.5%	

MEW S

The Added Value to DHA and Hospitals that can be Achieved from the Development of this Model.

Saving lives

Proactively identify critical cases and act on them before the situation deteriorates. This would have a knock-on effect of freeing resources for other critical patients.

Resource Optimization

Properly allocate doctors and nurses to patients that need most attention and care. This includes allocating less resources to less critical cases while focusing on more critical cases.

Reduce the pressure

Augments the decision making of medical staff by providing less experienced staff with information that may be difficult to discern without years of experience.

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Conclusion

AI is the future.

We need to build a structured approach and methodology to implement it using the "big data" now available in EMRs.

This process must be undertaken in a considered manner, keeping the patient's safety as the primary focus

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شكرًا على المتابعة

Thanks for your attention
Please share your thoughts