CSL Behring

Applicability and development of artificial intelligence in critical patients

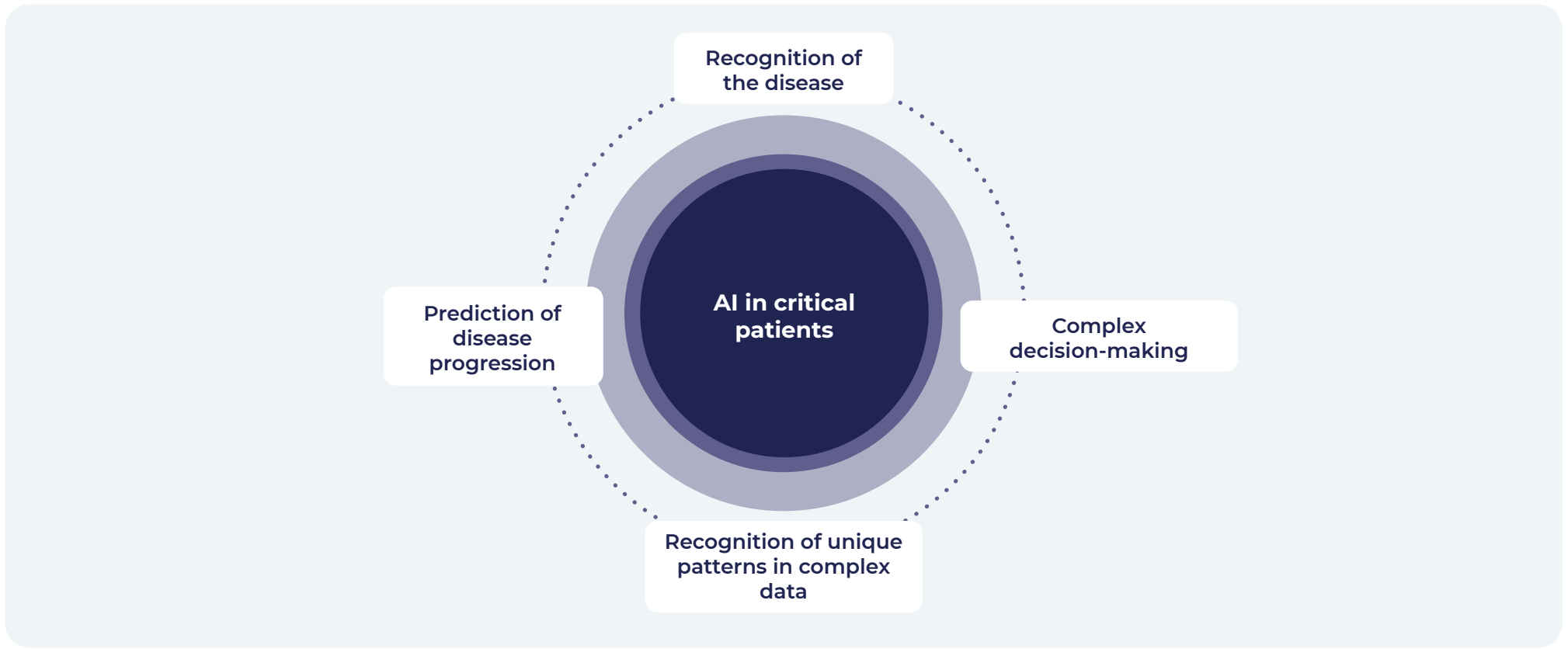
Moderator: Miguel Ángel Taberna Izquierdo

Monday, May 13, 2024

1. WHAT DIRECTIONS DO WE HAVE IN TERMS OF ARTIFICIAL INTELLIGENCE?

Juan José Beunza Nuin

Artificial intelligence (AI) has the ability to transform the ICU at different levels[1]:



Patient monitoring / sensorization (Internet of Medical Things)

- Automation
- Streaming (machine learning and real-time)
- There are many monitorable variables and variables susceptible to monitoring[2,3]
- AI helps reduce the number and duration of false alarms and promotes effective monitoring[4]

Prediction of disease progression[5-8]

Support in clinical decision

- Early detection
- Predictive models
- Precision medicine

Using generative AI

- Ability to create new ideas and contents, beyond machine learning

RECOMMENDATIONS:

1. Training with own data is fundamental:

- The similarities and discrepancies between cohorts used for training and the local population have to be considered.
- Clinical validation is essential (at the beginning and then regularly).

2. Smaller models with texts and specific clinical tasks provide better results (as well as local, cheaper, more private) than general large language models (LLM)[9,10].

3. It is essential to train clinicians in the use of AI.

4. This should be an interprofessional endeavor: clinicians together with IT experts and linguists. Intensivists should be involved in the process from the start.

CHALLENGES POSED BY AI IN THE ICU:

- **Interpretability**
- **Lower clinical preparation**
- **Privacy and data exchange**
- **Suboptimal compliance with standards**

CONSIDERATIONS GOING FORWARD:

- Efficient data transfer
- Data de-identification
- Fast processing
- Quality assurance
- Decentralized federated learning

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2. PRACTICAL APPLICATION OF ARTIFICIAL INTELLIGENCE IN CRITICAL PATIENTS

Federico Gordo Vidal

AI is the ability of machines to simulate human intelligence.

Creating systems that can learn, reason and make decisions in a similar way to a human.
Thus, AI comprises mathematical models that depend on the data they analyze in an advanced manner and that they use to generate answers.

AI is present in daily activities in the ICU and around critical patient care. However, its applications will grow exponentially and the whole healthcare model will change:

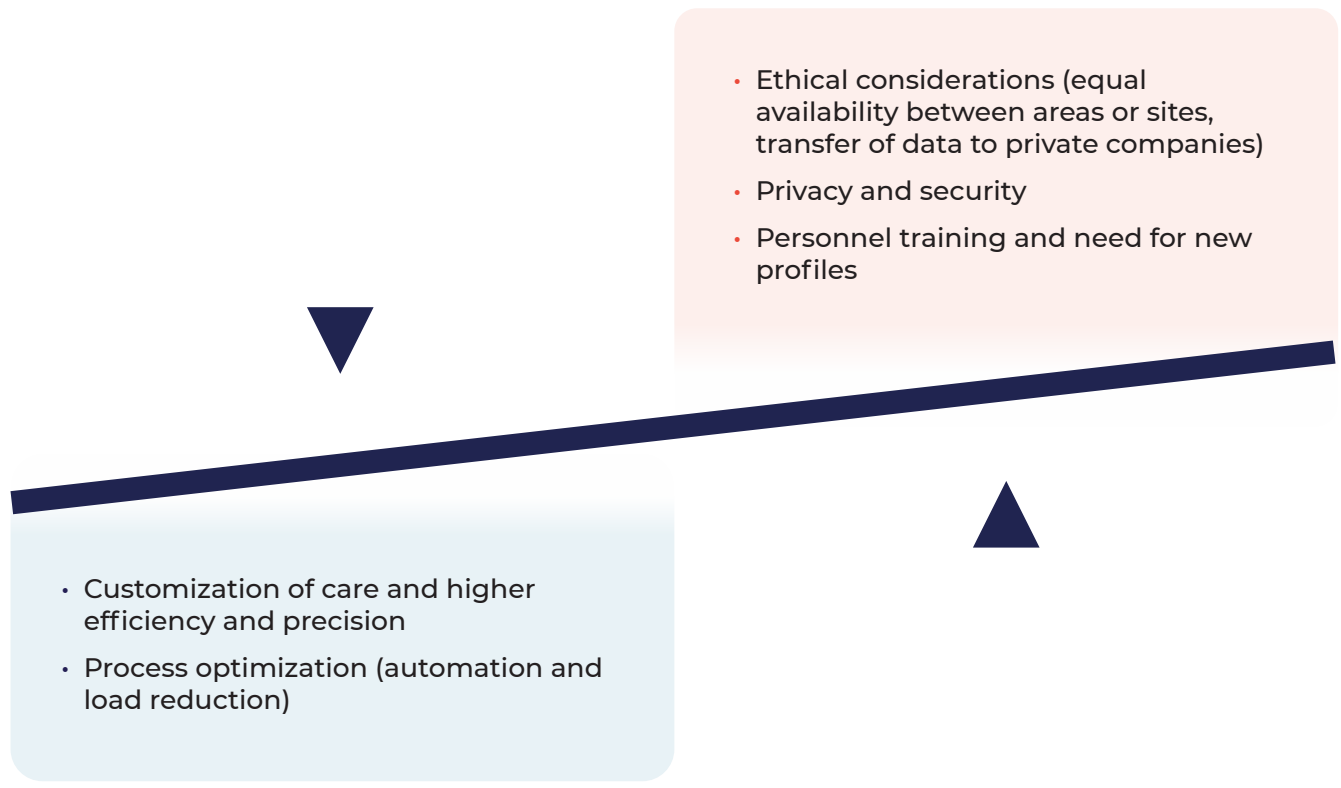
- Early detection and admission assessment
- Score follow-up and severity evolution
- Detection of sepsis
- Identification of phenotypes with different approaches
- Monitoring or imaging systems embedded in medical equipment
- Generative AI for the development of studies, protocols, etc
- Search of clinical information

Currently, the best application of AI has to do with clinical decision-making assistance systems and task simplification.

Characteristics of intensive medicine that make AI particularly necessary in the ICU[11]:

- Complexity
- High costs
- Uncertainty in results
- Need for prediction
- Variability
- Need to reduce adverse effects
- Volume of data stored in real time

BENEFITS VERSUS DRAWBACKS OF AI



MODELS USED BY AI*

Supervised learning	Unsupervised learning	Neural networks
Model training with labeled data to perform precise predictions	Unlabeled data processing and pattern discovery with no previous guide	Mimic the human brain function

* Not all generated models are applicable outside of the environment where they were trained.

Critical steps in the implementation of AI in clinical practice[12]:

1. **Creating reliable, cooperative, accessible databases.**
   - Are quality data really accessible in the ICU?
2. **Connection of fully integrated equipment and systems that speak the same language and can transfer information in real time.**
3. **Incorporation of professional profiles that allow working with AI systems and data in an interdisciplinary manner.**

Standardization processes and ethical approaches are required to use AI. Besides, for the time being, all decisions must be supervised by a specialist.

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