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AOU Parma - Università di Parma
Presidente SIAARTI 2025-27**

Titolo **Big Data e Intelligenza Artificiale in sanità**

Plenaria di avvio dei corsi manageriali Sessione autunnale 2024

Milano, 14 novembre 2024



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Presidente SIAARTI 2025-27**

Titolo

Nuove tecnologie in sanità

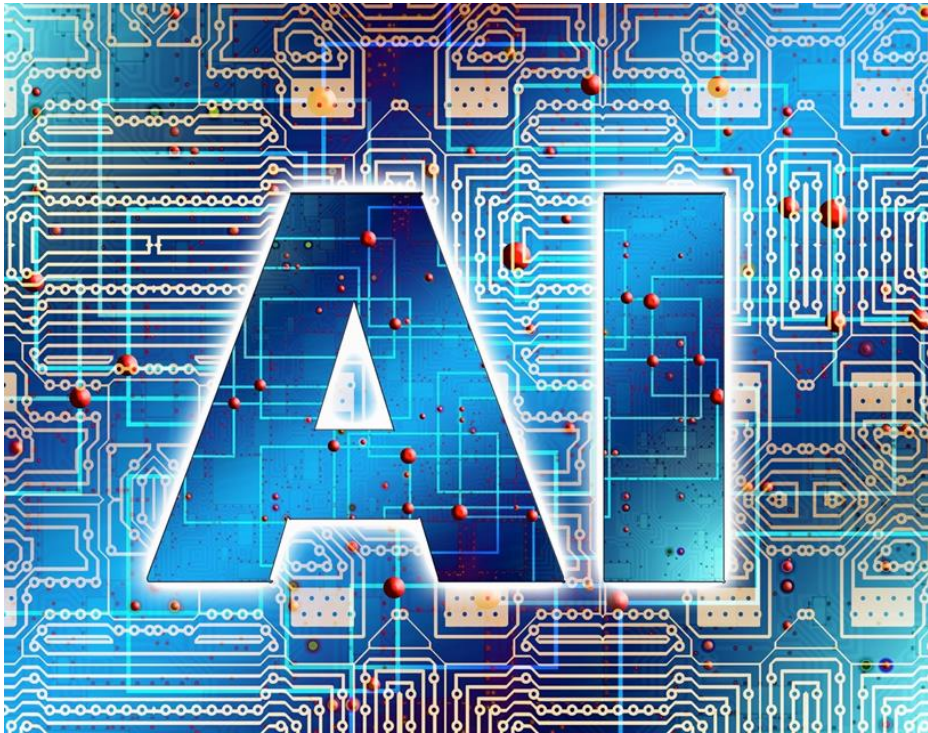
Plenaria di avvio dei corsi manageriali Sessione autunnale 2024

Milano, 14 novembre 2024

Conflitto di interessi



Intelligenza Artificiale



L'intelligenza artificiale
è una *tecnologia informatica*
(e statistica)
attraverso cui
le macchine e i sistemi informatici
simulano
i processi di intelligenza umana

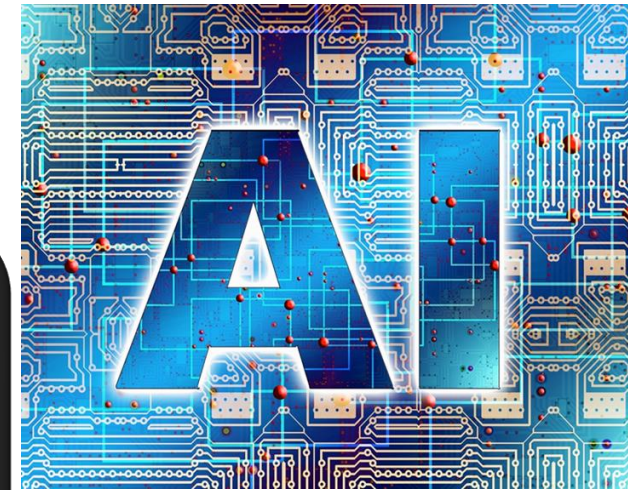


UNIVERSITÀ
DI PARMA

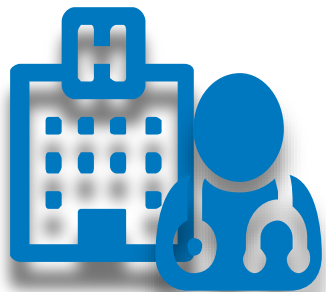
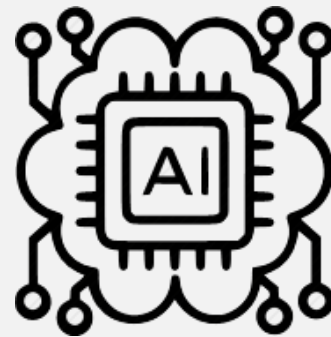
Predictive

Predictive AI uses large data repositories to recognize patterns across time.

Predictive AI applications draw inferences and suggest outcomes and future trends



Artificial
Intelligence



Generative

Generative AI software creates images, text, video, and software code based on user prompts

Big Data, il nuovo oro nero



Big Data, il nuovo oro nero

Table 1. Examples of types of data available in the operating room (examples can vary by practice)

	Data created as part of standard of care	Data NOT routinely created as part of standard of care
Data routinely recorded	<ul style="list-style-type: none">• Vital signs• Most radiographic images• Selected device data (e.g., ventilation)• Administrative (e.g., supplies)	<ul style="list-style-type: none">• Research
Data NOT routinely recorded	<ul style="list-style-type: none">• Patient data (e.g., images, video, audio)• Device data (e.g., table position, energy device electric resistance measures, stapler pressure measurements, etc.)• Surgeon data (e.g., kinematics, eye tracking)• Healthcare team interactions (e.g., operating room “black box”)	<ul style="list-style-type: none">• Research

LET'S TALK ABOUT DATA

Artificial Intelligence

*Artificial Intelligence need a
FUEL...*

....BIG DATA

BIG PROBLEMS....





Il termine BIG DATA in sanità si riferisce a set di dati sanitari elettronici così grandi e complessi da essere difficili (o impossibili) da gestire con software e/o hardware tradizionali.

NON possono essere facilmente gestiti con strumenti e metodi di analisi tradizionali

Big Data and 4 «V»

*data per patient
and/or
aggregation of
data*



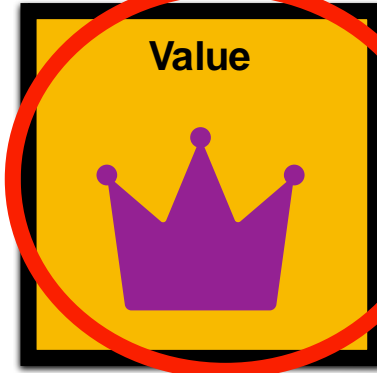
*Data come
form different
sources*

*high-speed
or real-time
data
acquisition*

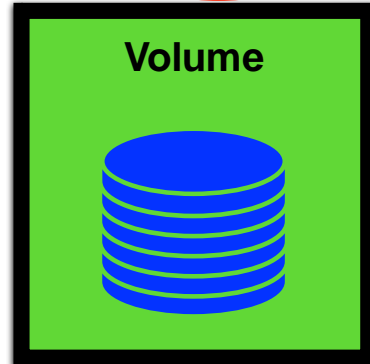
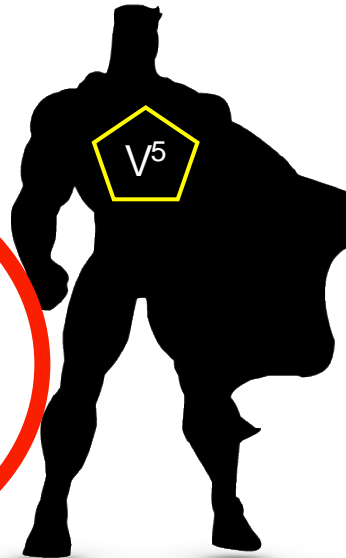
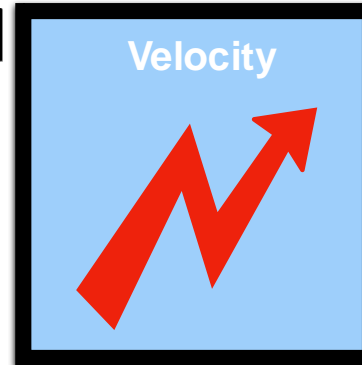
*high data
quality
by limitation
of manual
data entry*

THE 5VS: BIG DATA IN ANESTHESIA AND INTENSIVE CARE

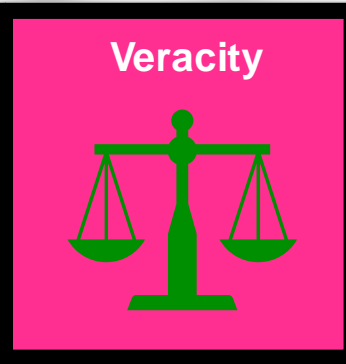
VALUE. Through the use of new technologies, it is possible to obtain intelligent tools for improving outcome, risk prediction and resources optimization.



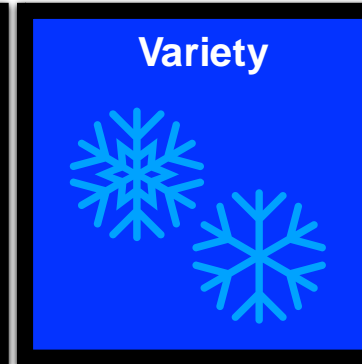
VELOCITY. Big Data is characterized by a high acquisition speed, often in real time.



VOLUME. Computerization has made it possible to have huge amounts of data, both in anesthesia and intensive care.



VERACITY. Extrapolating the data directly from the sources has made possible to take the quality to another level, limiting human interference to a minimum.



VARIETY. IoT technologies allow to extrapolate information from different machines, such as monitors, ventilators, medical instruments etc.

**“VALUE”
and you can get
tools
to improve
risk predictions
and
patient
outcomes**

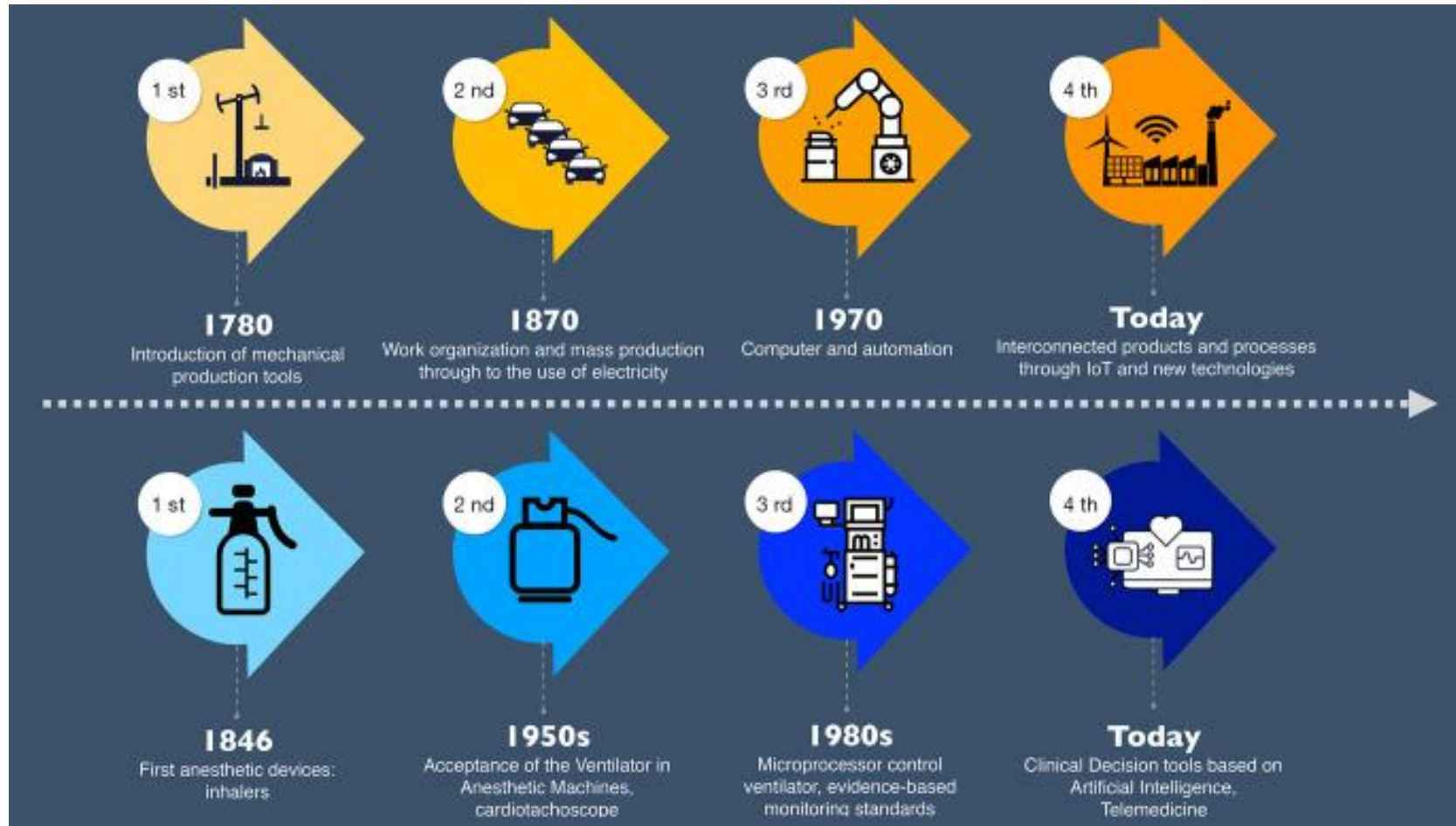
L'evoluzione dell'anestesiologia



- 16 ottobre 1846
- Dott. Morton (dentista)
- Etere
- **Sala del Massachusetts General Hospital**
- Poi...il chirurgo John Collins Warren asportò un tumore del collo al volontario, il signor Albert Abbott, che non provò alcun dolore

Big Data System

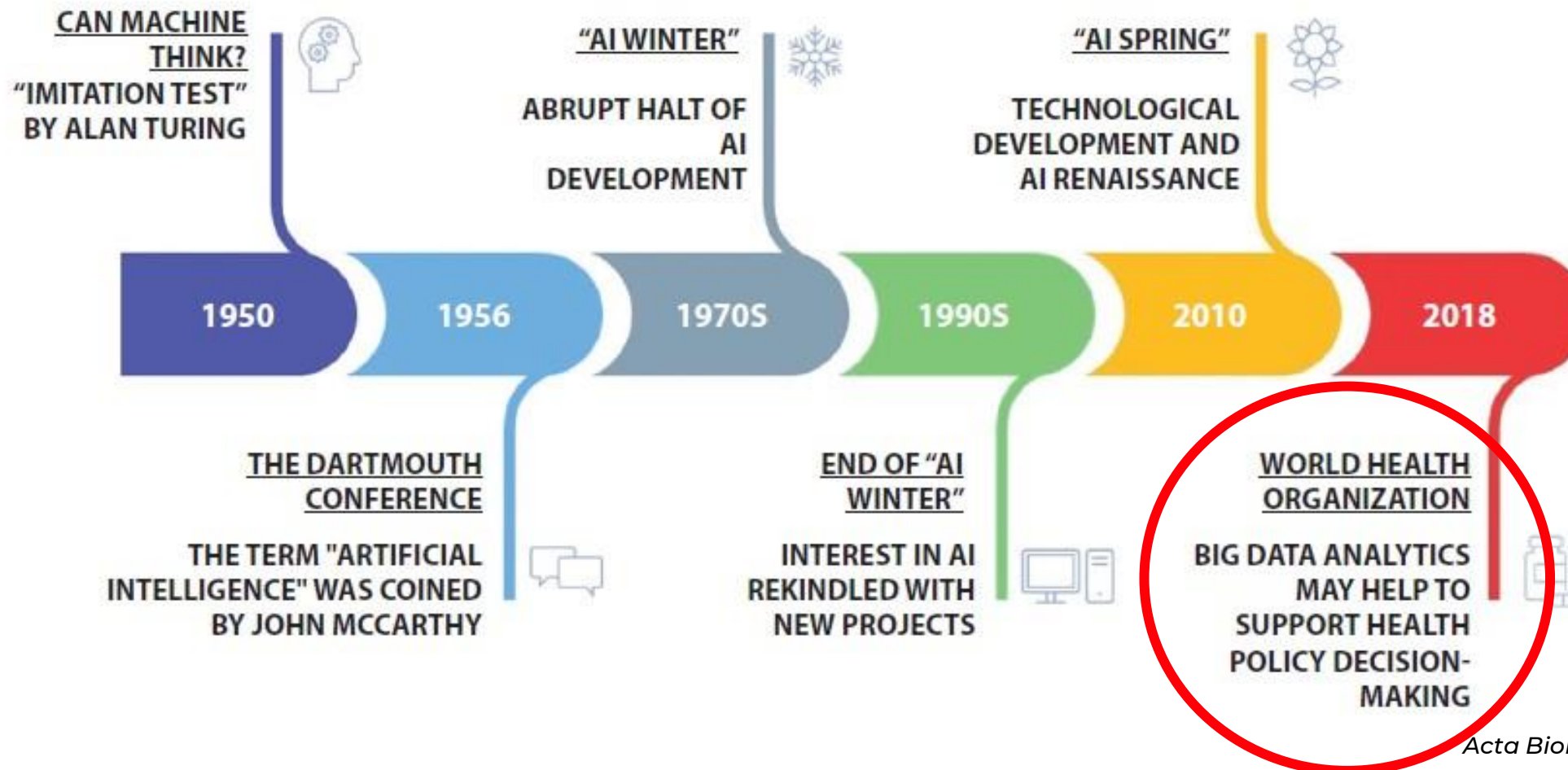
L'evoluzione dell'anestesiologia



Understanding basic principles of artificial intelligence: a practical guide for intensivists

Valentina Bellini^{1}, Marco Cascella^{2,3*}, Franco Cutugno³, Michele Russo¹, Roberto Lanza¹,
Christian Compagnone¹, Elena Bignami¹*

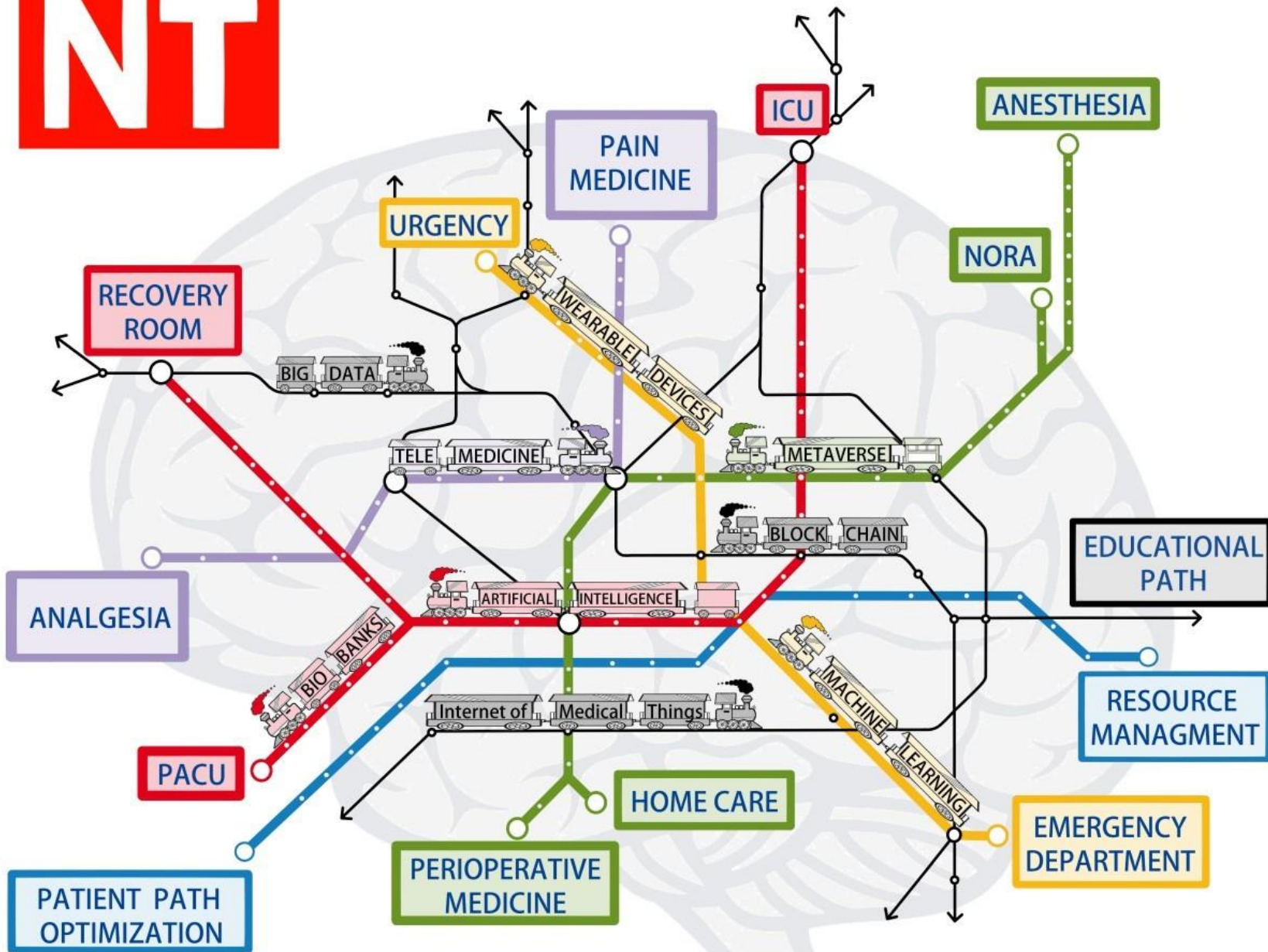
TIMELINE DIAGRAM OF ARTIFICIAL INTELLIGENCE HISTORY



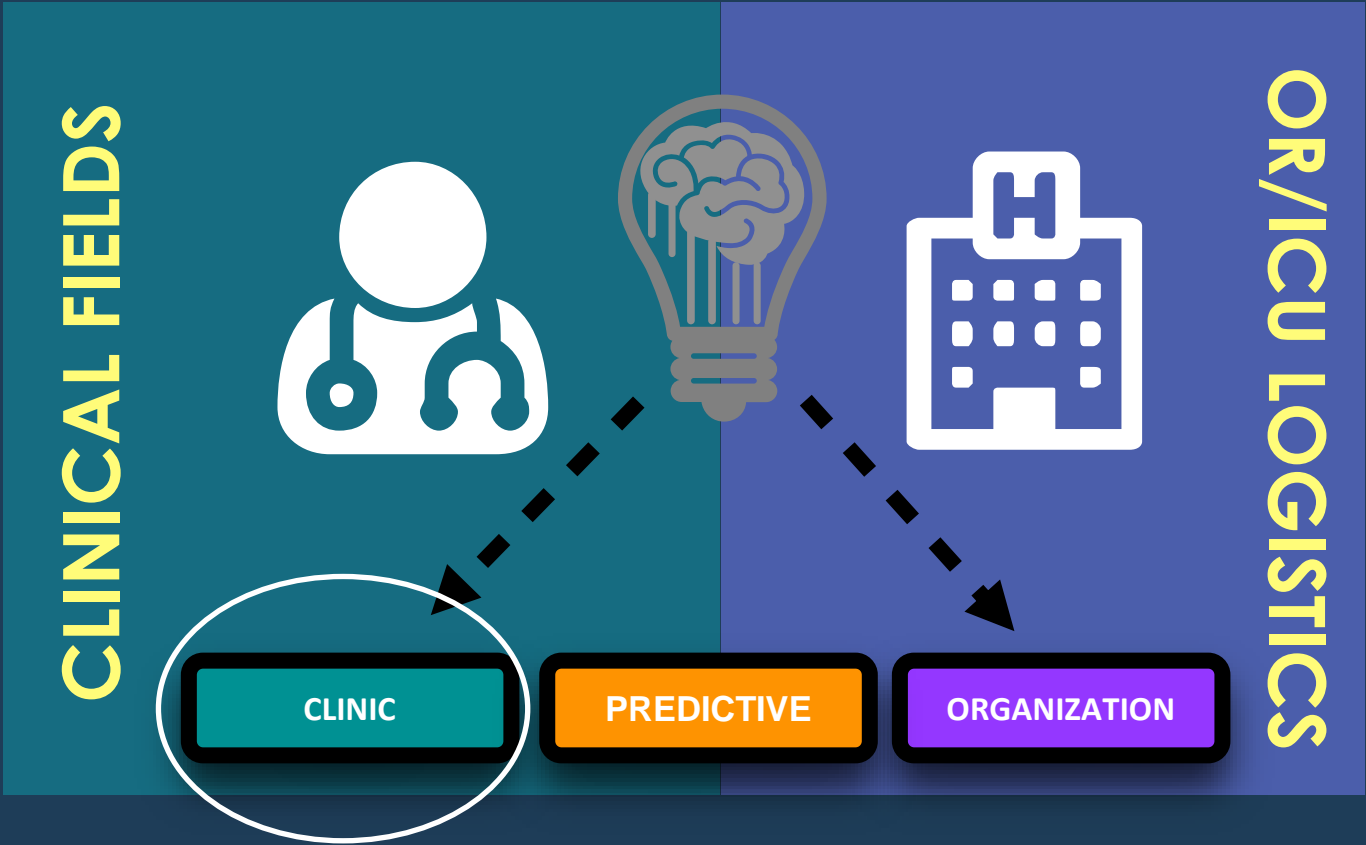
MACHINE LEARNING



E' una branca
dell'intelligenza
artificiale che si occupa
di studiare sistemi in
grado di portare un
computer ad
**apprendere
dall'esperienza**



Artificial Intelligence & NT



AI in clinica



ACQUISIZIONE DI DATI

INTERPRETAZIONE DEI DATI

SIMULAZIONE DI SCENARI
(Clinici e Organizzativi)

CREAZIONE MODELLI (CLINICI)
PREDITTIVI

AI in ICU



ALLARMI/FATIGUE

MODALITA' DI VENTILAZIONE
MECCANICA

SEDAZIONE FARMACOLOGICA

EMODINAMICA, AKI

SEPSI&ATB

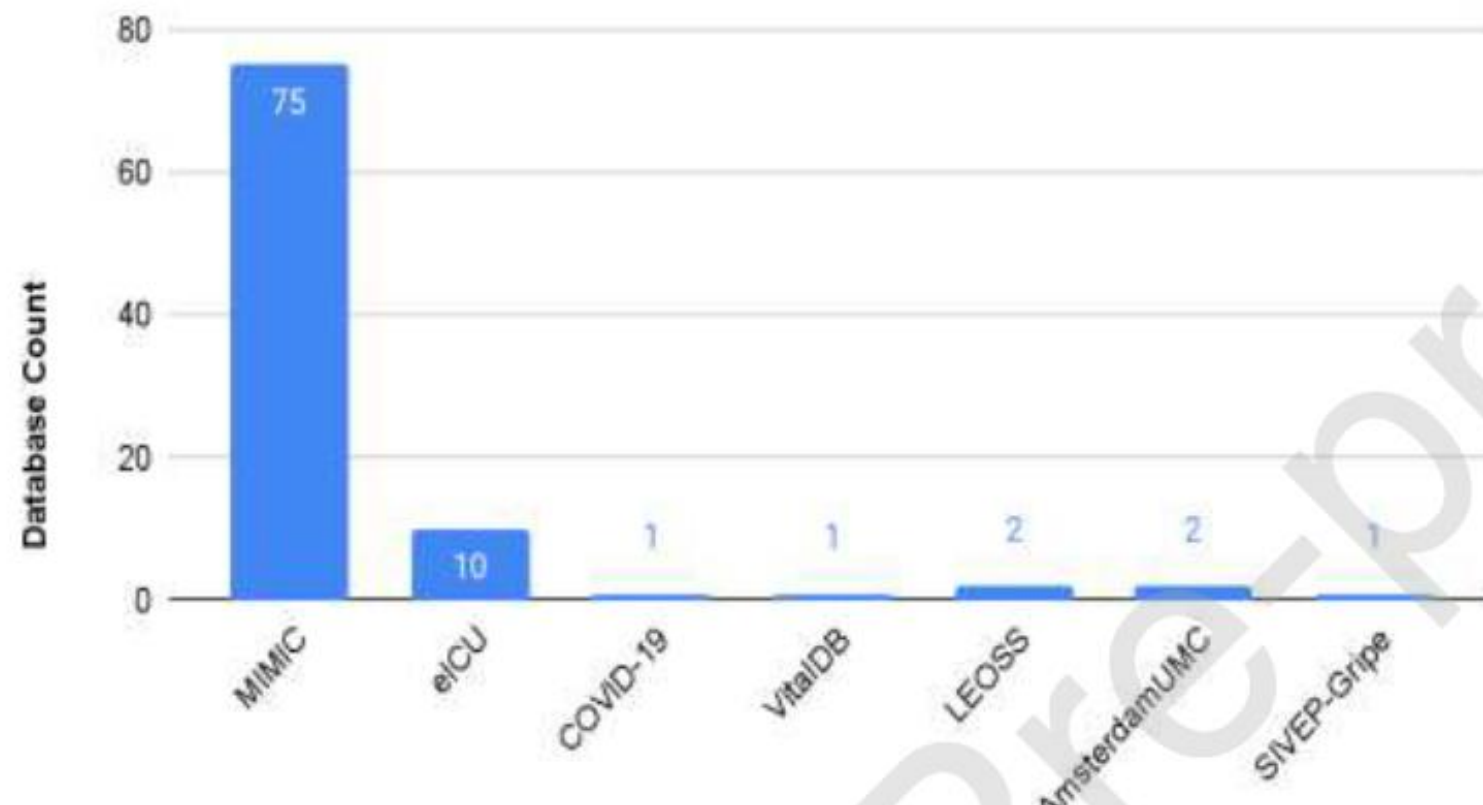
Availability of information needed to evaluate algorithmic fairness - A systematic review of publicly accessible critical care databases

Fong N, Langnas E, Law T, Reddy M, Lipnick M, Pirracchio R.

Anaesth Crit Care Pain Med. 2023 May 19:101248. doi: 10.1016/j.accpm.2023.101248

Publicly Accessible Database Frequency

Number of times each database appeared in literature review



ML may improve
clinical decision-making
in critical care settings



ATM ANNALS OF TRANSLATIONAL MEDICINE
AN OPEN ACCESS JOURNAL COVERING ALL SUBSPECIALTIES OF TRANSLATIONAL MEDICINE

Home Journal Info For Authors For Reviewers Ethics and Policies Special Contents Archives Online First

Home / Vol 10, No 9 (May 15, 2022) / Artificial intelligence and anesthesia: a narrative review

Review Article [Check for updates](#)

Artificial intelligence and anesthesia: a narrative review

Valentina Bellini¹, Emanuele Rafano Carnà¹, Michele Russo¹, Fabiola Di Vincenzo², Matteo Berghenti², Marco Baciarello¹, Elena Bignamì¹

Closed-loop anesthesia

Monitoraggio DoA

Identificazione strutture in US

Gestione del dolore postoperatorio

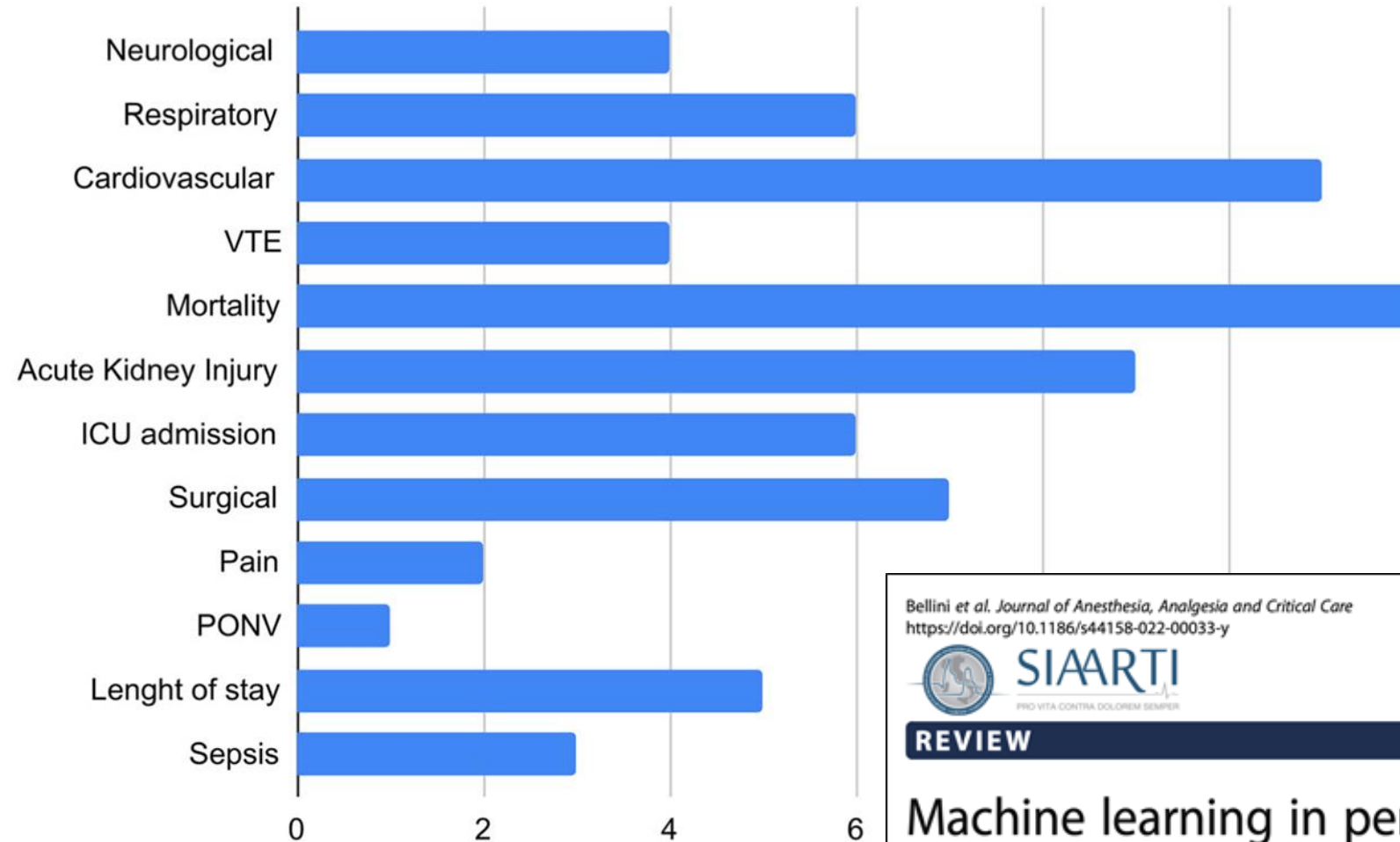
Valutazione delle vie aeree

MEDICINA PERIOPERATORIA



I modelli predittivi riescono a superare i limiti degli score tradizionali, sfruttando **tecniche predittive dinamiche** ed essendo in grado di fornire anche **output real time**

PERIOPERATIVE MEDICINE



Bellini et al. *Journal of Anesthesia, Analgesia and Critical Care* (2022) 2:2
<https://doi.org/10.1186/s44158-022-00033-y>

(2022) 2:2

Journal of Anesthesia,
Analgesia and Critical Care



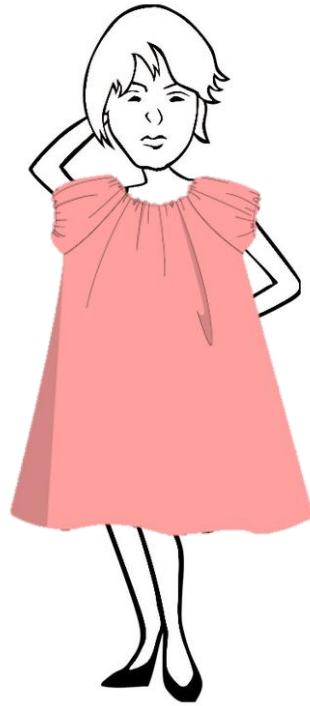
REVIEW

Open Access

Machine learning in perioperative medicine: a systematic review

Valentina Bellini¹, Marina Valente², Giorgia Bertorelli¹, Barbara Pifferi¹, Michelangelo Craca¹, Monica Mordonini³, Gianfranco Lombardo³, Eleonora Bottani³, Paolo Del Rio² and Elena Bignami^{1*}





INTELLIGENT SCORE

*Moving from "generic risk scores" to
"tailored risk scores "
for a specific patient and specific procedure in
real time*





Article

Improving Intensive Care Unit Early Readmission Prediction Using Optimized and Explainable Machine Learning

José A. González-Nóvoa ^{1,*} , Silvia Campanioni ¹ , Laura Busto ¹ , José Fariña ² ,
Juan J. Rodríguez-Andina ² , Dolores Vila ³, Andrés Íñiguez ⁴ and César Veiga ¹ 

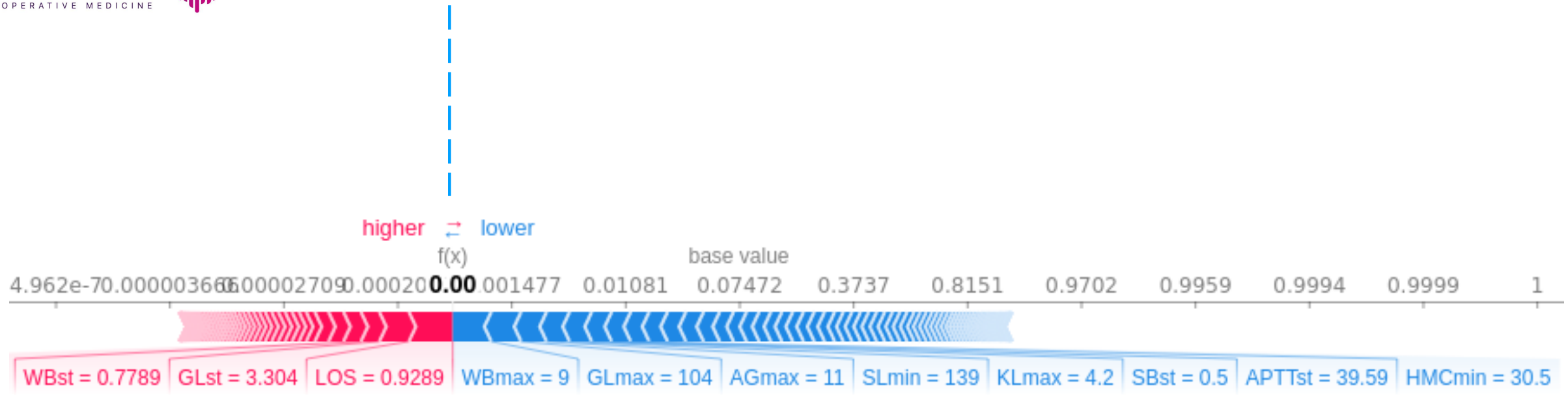
¹ Galicia Sur Health Research Institute (IIS Galicia Sur), Álvaro Cunqueiro Hospital, 36310 Vigo, Spain

² Department of Electronic Technology, University of Vigo, 36310 Vigo, Spain

³ Intensive Care Unit Department, Complejo Hospitalario Universitario de Vigo (SERGAS),
Álvaro Cunqueiro Hospital, 36213 Vigo, Spain

⁴ Cardiology Department, Complejo Hospitalario Universitario de Vigo (SERGAS),
Álvaro Cunqueiro Hospital, 36213 Vigo, Spain

* Correspondence: jose.gonzalez@iisgaliciasur.es



READMISSION

NON-READMISSION

Article

Improving Intensive Care Unit Early Readmission Prediction Using Optimized and Explainable Machine Learning

José A. González-Nóvoa ^{1,*}, Silvia Campanioni ¹, Laura Busto ¹, José Fariña ², Juan J. Rodríguez-Andina ², Dolores Vila ³, Andrés Íñiguez ⁴ and César Veiga ¹

Artificial Intelligence & NT



Research

JAMA Surgery | Original Investigation

Understanding Costs of Care in the Operating Room

Christopher P. Childers, MD; Melinda Maggard-Gibbons, MD, MSHS



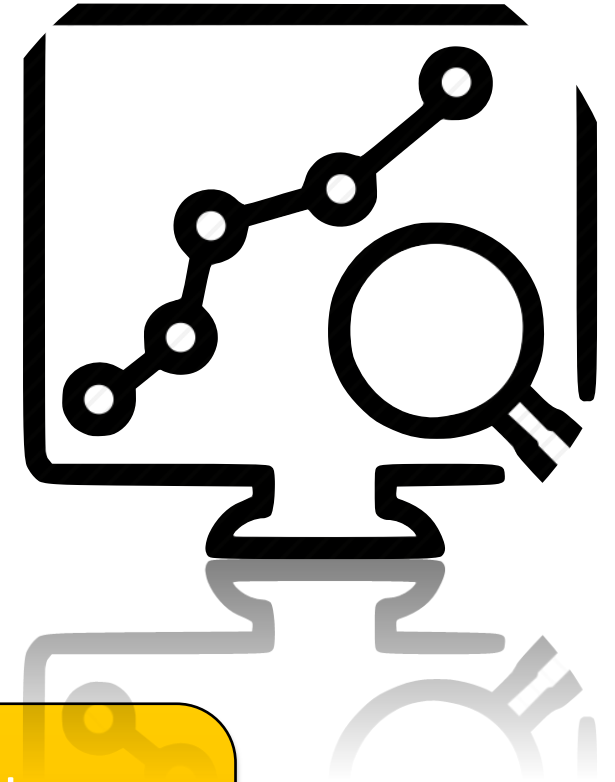
CONCLUSIONS AND RELEVANCE The mean cost of OR time is \$36 to \$37 per minute, using financial data from California's short-term general and specialty hospitals in FY2014. These statewide data provide a generalizable benchmark for the value of OR time. Furthermore, understanding the composition of costs will allow those interested in value improvement to identify high-yield targets.



Artificial Intelligence: A New Tool in Operating Room Management. Role of Machine Learning Models in Operating Room Optimization

Valentina Bellini¹ · Marco Guzzon² · Barbara Bigliardi² · Monica Mordonini² · Serena Filippelli² · Elena Bignami¹ 

Received: 5 July 2019 / Accepted: 26 November 2019 / Published online: 10 December 2019
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Previsione durata intervento chirurgico

- Tuwatananurak et al. J Med Syst. 2019
- Childers et al. JAMA. 2018
- Shahabikargar et al. Stud Health Technol Inform. 2017

L'impiego di tecnologie di ML nella gestione del blocco operatorio è risultato FATTIBILE e sembra in grado di ottenere stime predittive ACCURATE.



- Luo et al. Health Informatics J. 2018

BLOC-OP STUDY

BLUETOOTH TRACKING INDOOR
SYSTEM

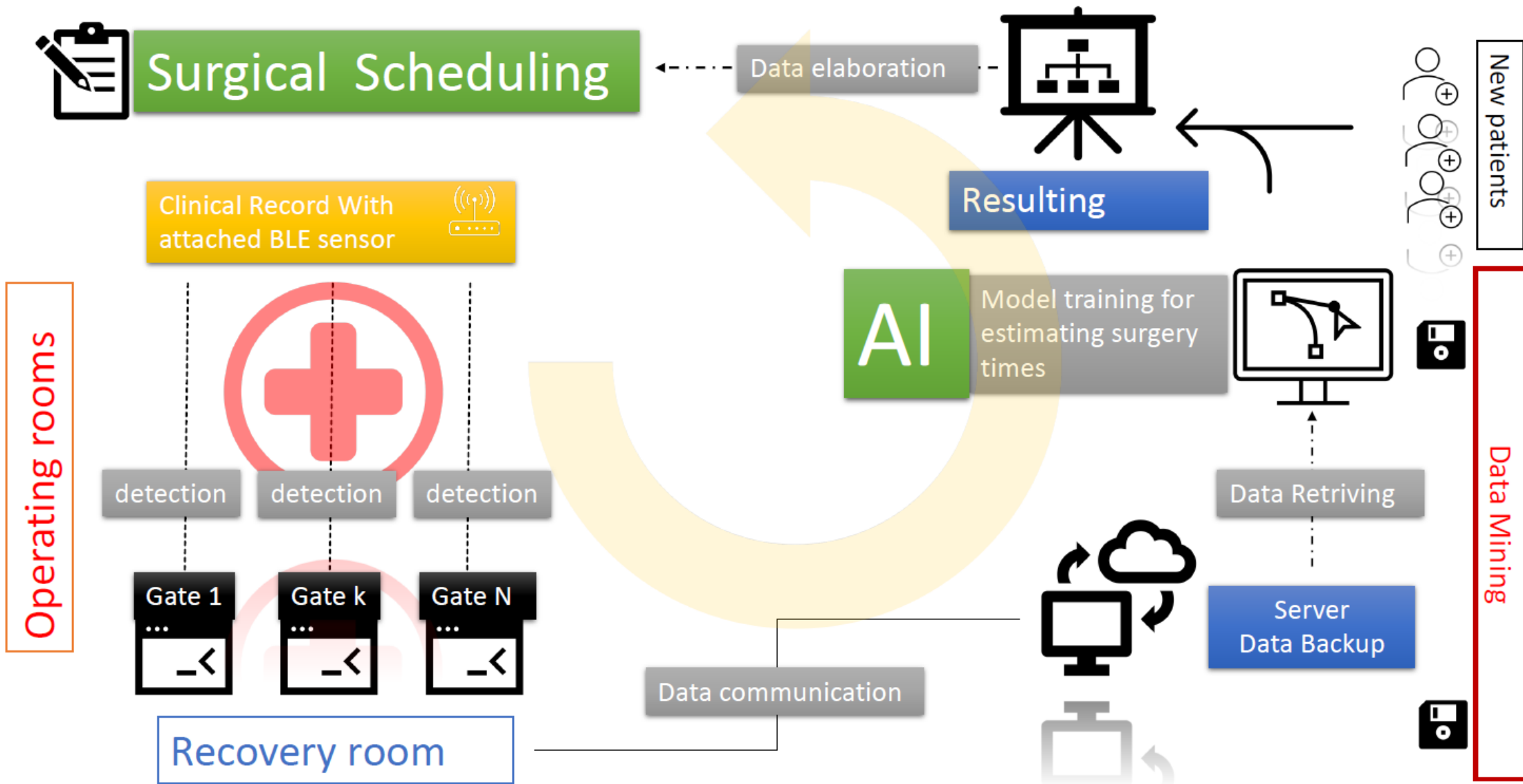
Number of patients:
1200



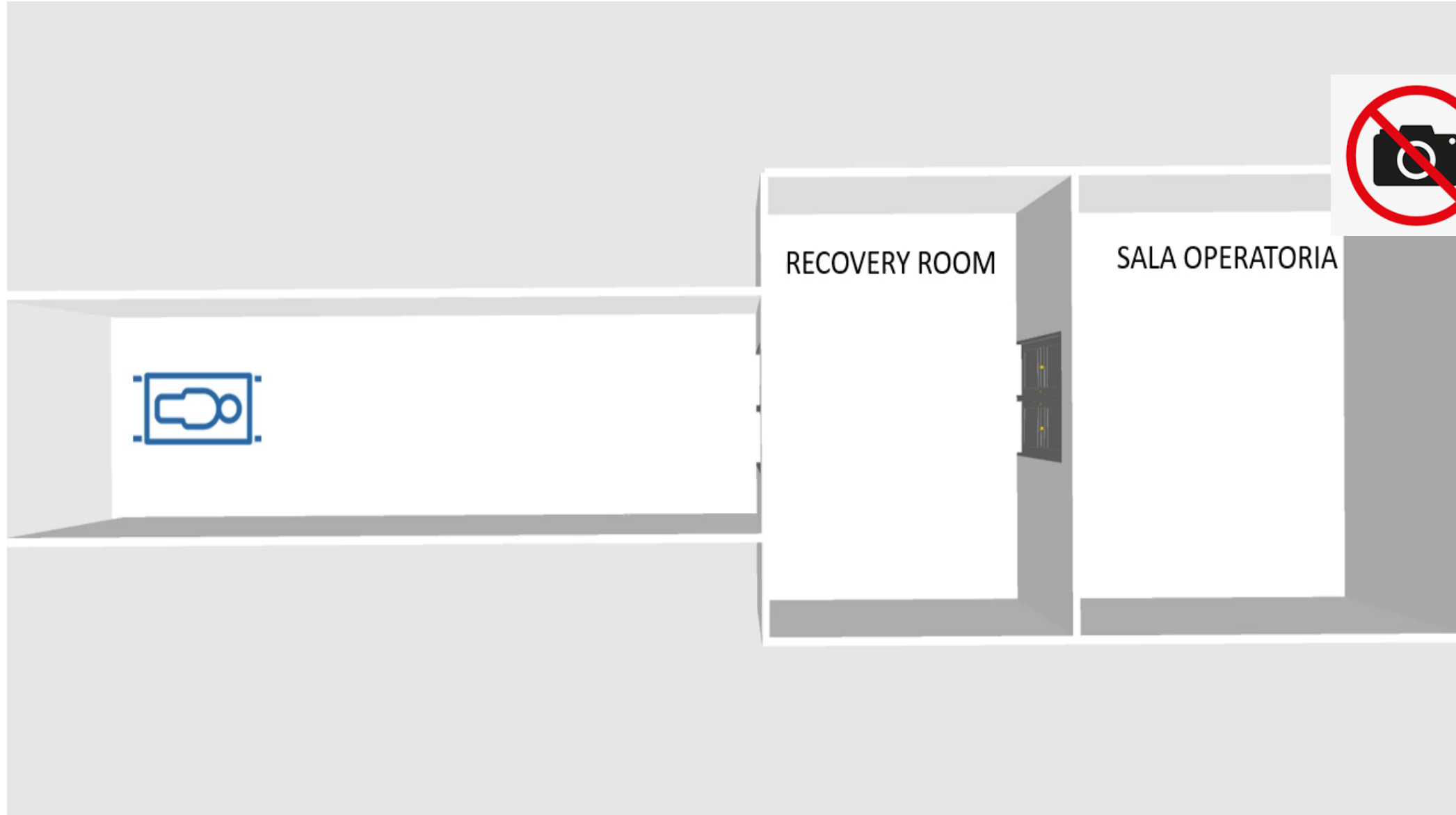
MACHINE LEARNING

INTEGRATED MODEL
TECHNOLOGICAL-ORGANIZATIONAL

BLOC-OP STUDY: scheduling and monitoring [®]











Medical Data Recorder (MDR)[®]





Medical Data Recorder (MDR)[®]

- GCS, neurologico
- Frequenza respiratoria
- PA (MAP)
- FC
- SatO₂
- Diuresi
- Sanguinamento
- PONV
- Dolore



- Tipologia di intervento

→ range di normalità e sicurezza

Ranges for alarm limits, per normal standards, used in the post anesthesia care unit from which data was acquired.

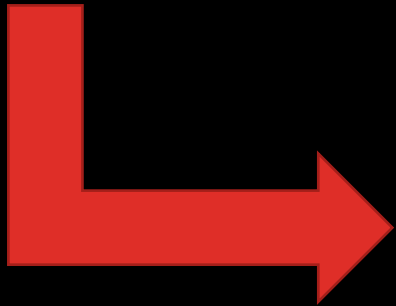
Biomedical signal	Range
SpO ₂	90–100%
Systolic blood pressure	90–185 mmHg
Heart rate	45-120 beats per minute
Respiratory rate	8-30 breaths per minute



Artificial Intelligence: A New Tool in Operating Room Management. Role of Machine Learning Models in Operating Room Optimization

Valentina Bellini¹ · Marco Guzzon² · Barbara Bigliardi² · Monica Mordonini² · Serena Filippelli² · Elena Bignami¹ 

Received: 5 July 2019 / Accepted: 26 November 2019 / Published online: 10 December 2019
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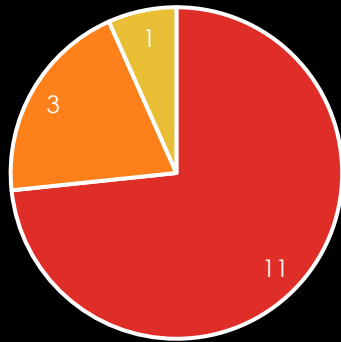


Artificial Intelligence in Operating Room Management

Valentina Bellini¹ · Michele Russo¹ · Tania Domenichetti¹ · Matteo Panizzi¹ · Simone Allai¹ · Elena Giovanna Bignami¹

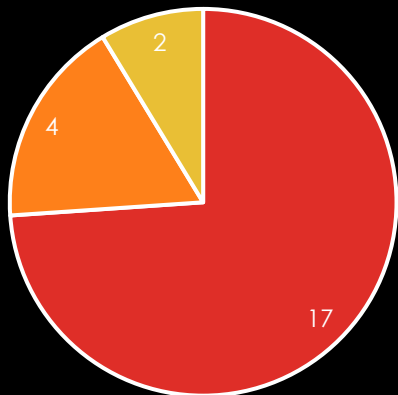
Received: 29 November 2023 / Accepted: 5 February 2024
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First review



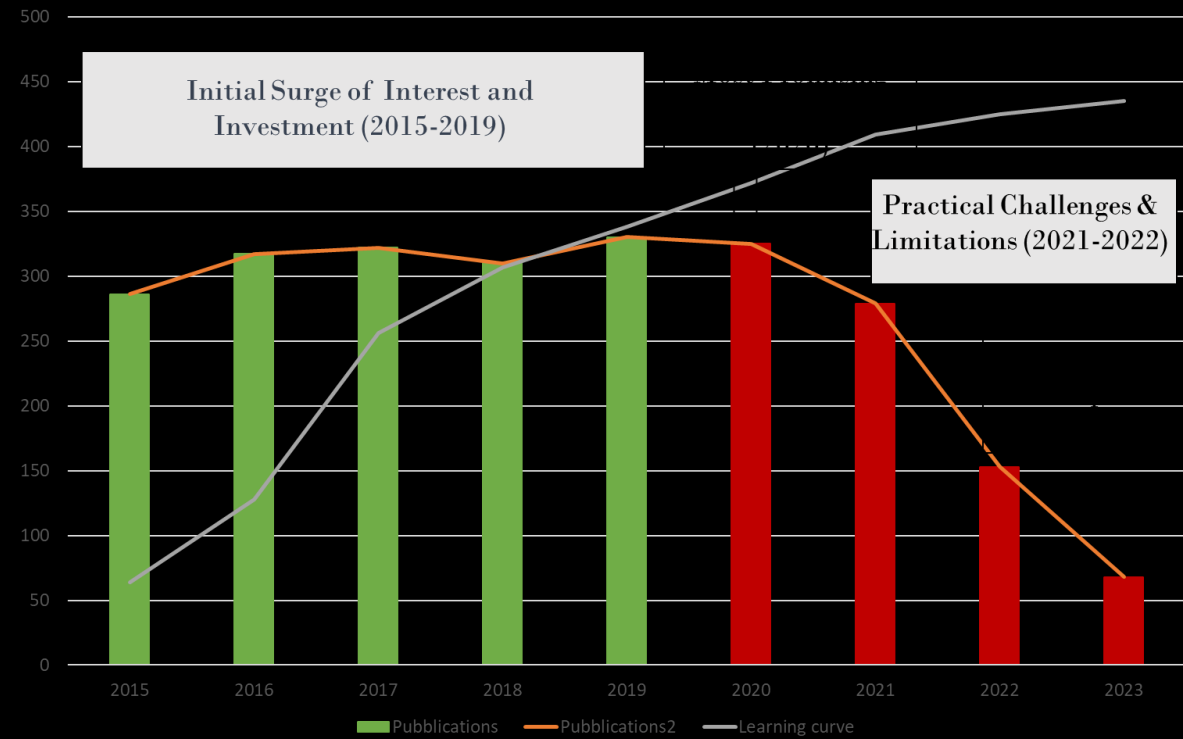
■ Prediction of surgery time
 ■ PACU LOS
 ■ Risk of cancellation

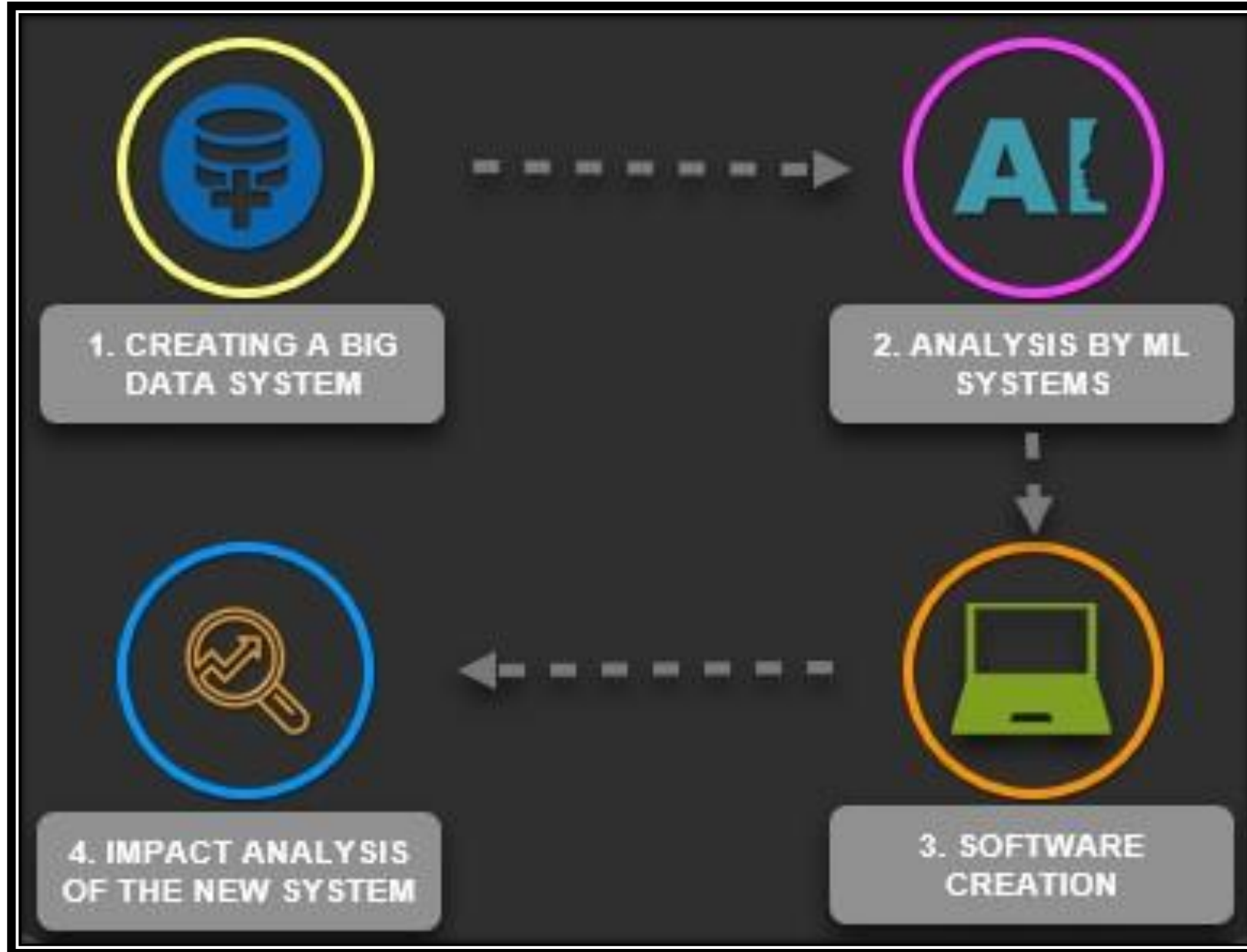
Update review



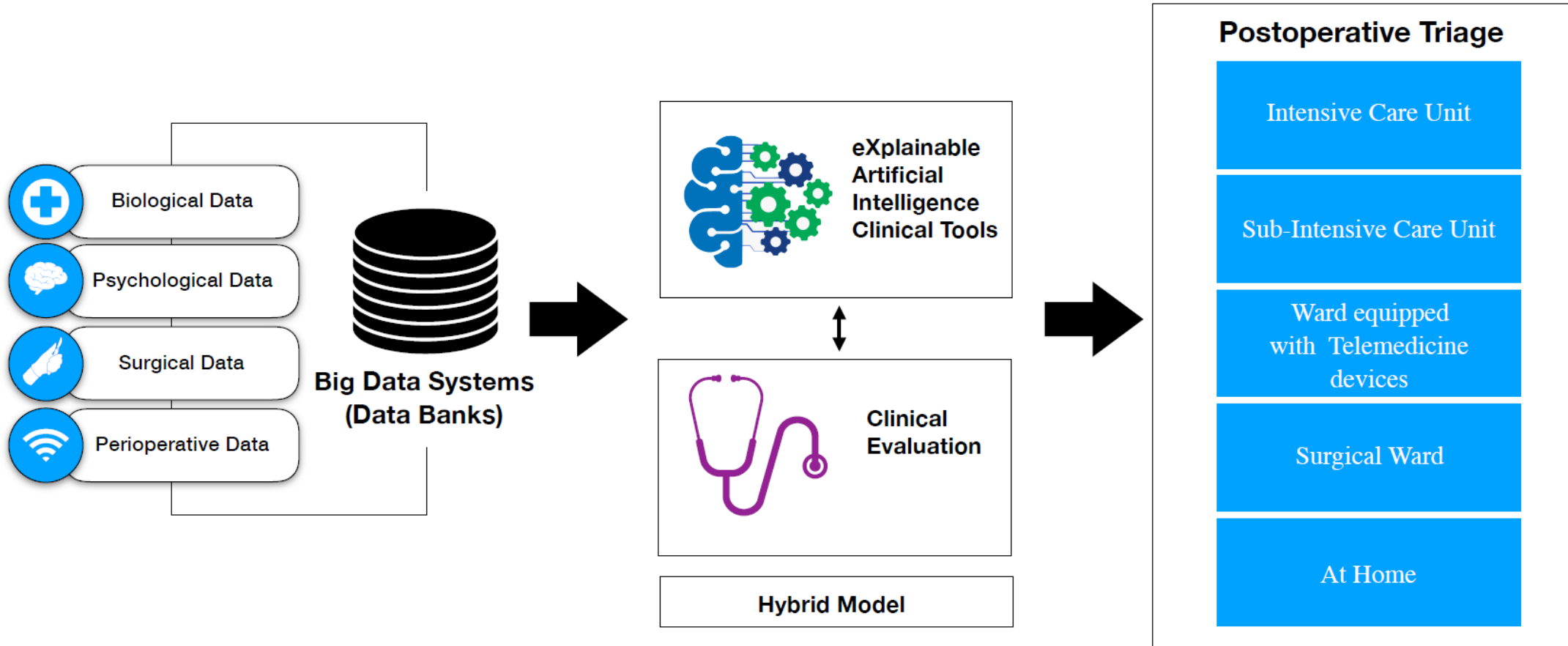
■ Prediction of surgery time
 ■ PACU LOS
 ■ Risk of cancellation

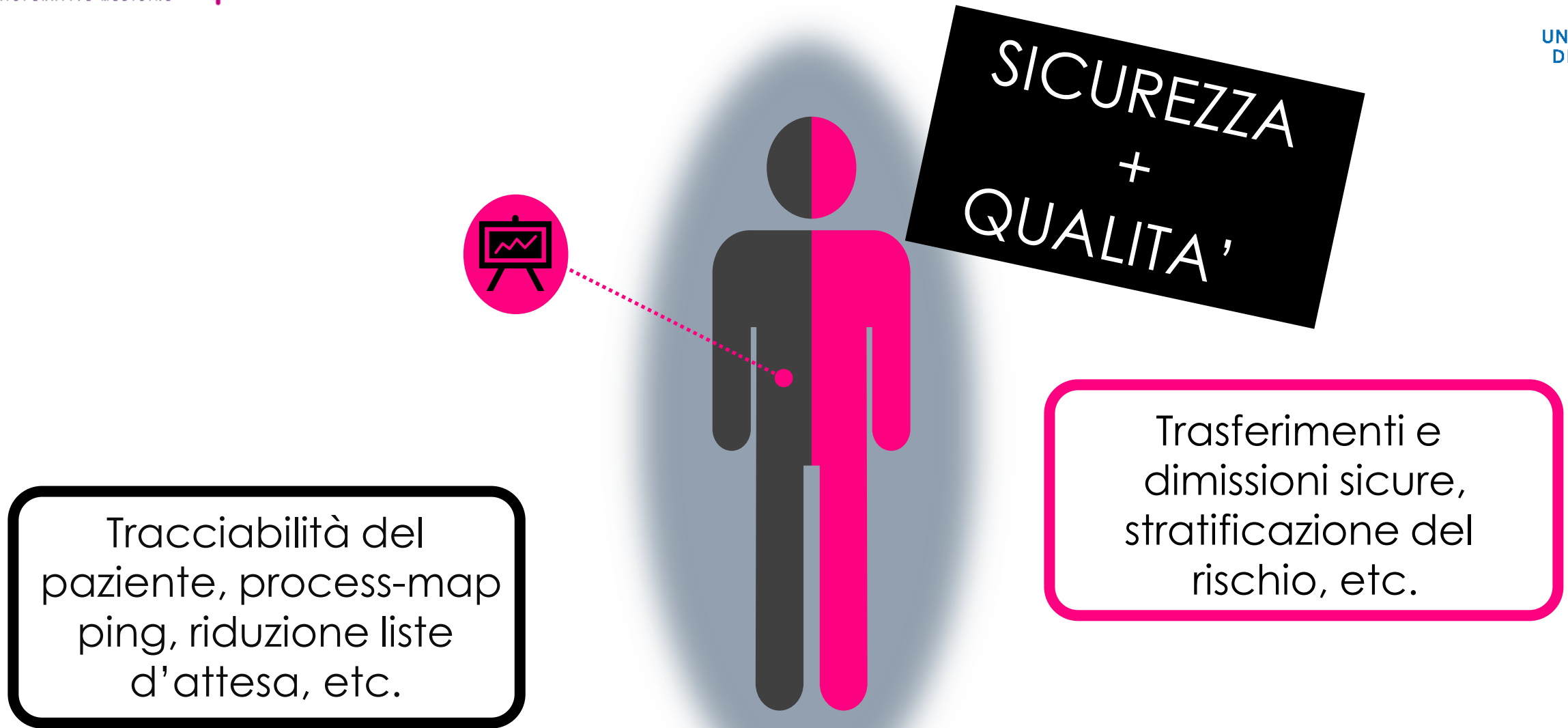
Fig.3 Learning curve of artificial intelligence and publications.





AI Multidisciplinary Surgical Department

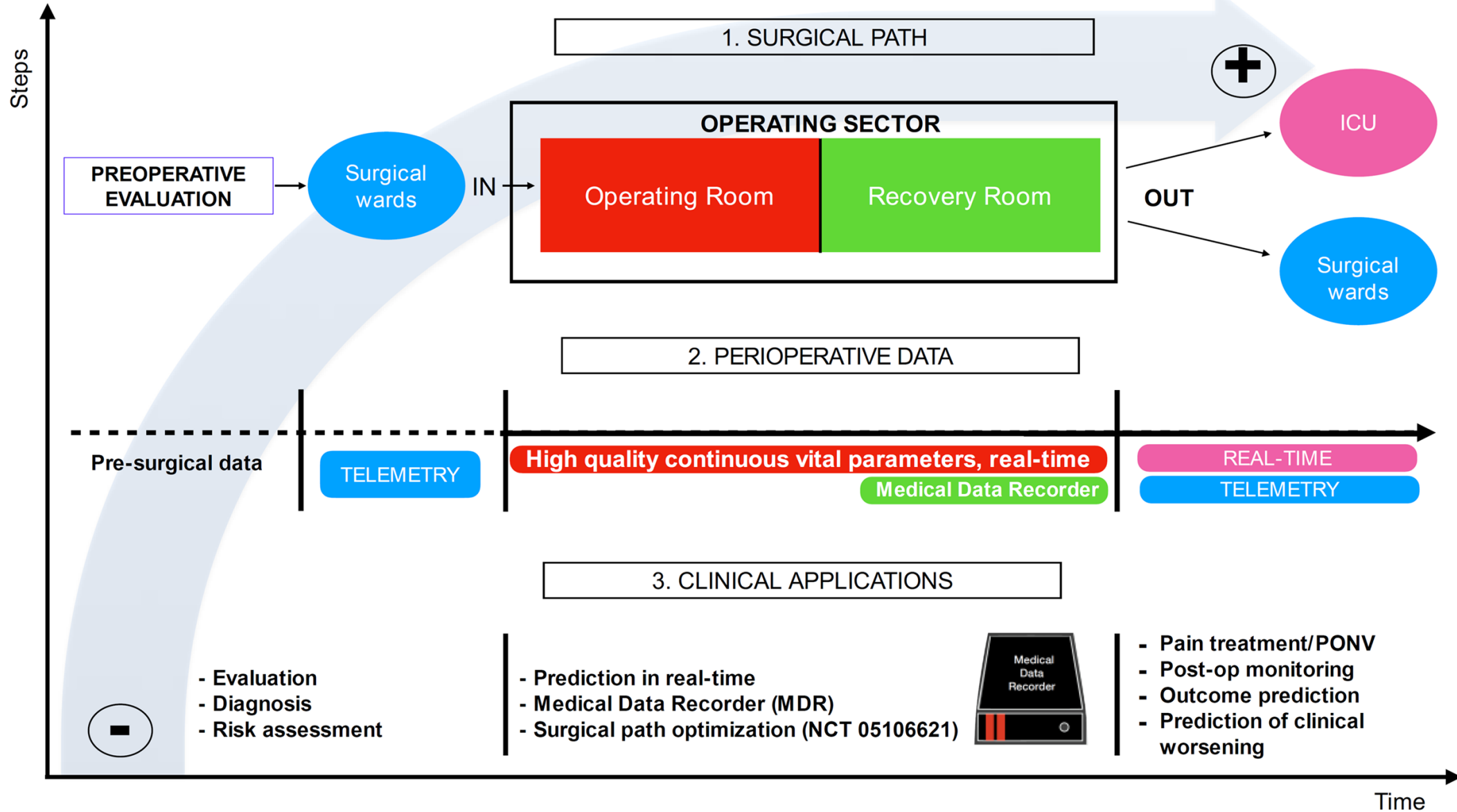




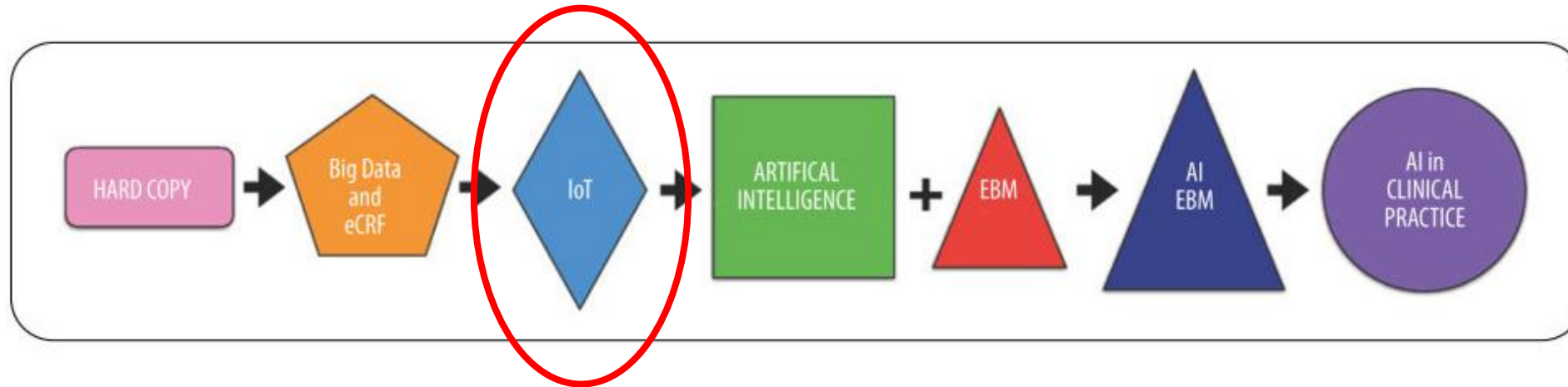
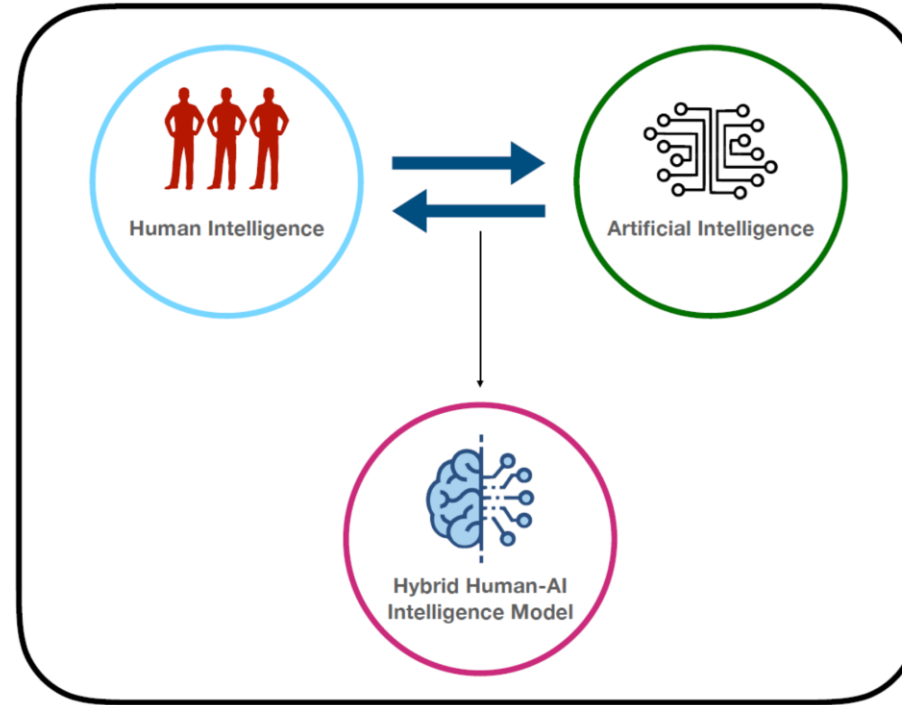
SICUREZZA
+
QUALITA'

Tracciabilità del
paziente, process-map
ping, riduzione liste
d'attesa, etc.

Trasferimenti e
dimissioni sicure,
stratificazione del
rischio, etc.

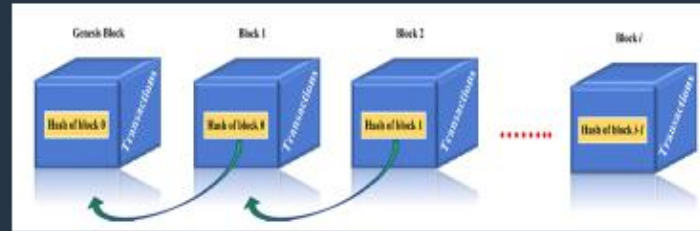


Human and Artificial Intelligence Hybrid Model



THE PROBLEM OF DATA QUALITY

BIG DATA
&
DATA-SHARING
DATA-MINING



BLOCKCHAIN TECHNOLOGY

- Immutability of data
- Cryptography
- Transparency

Zubaydi et al. Electronics. 2019



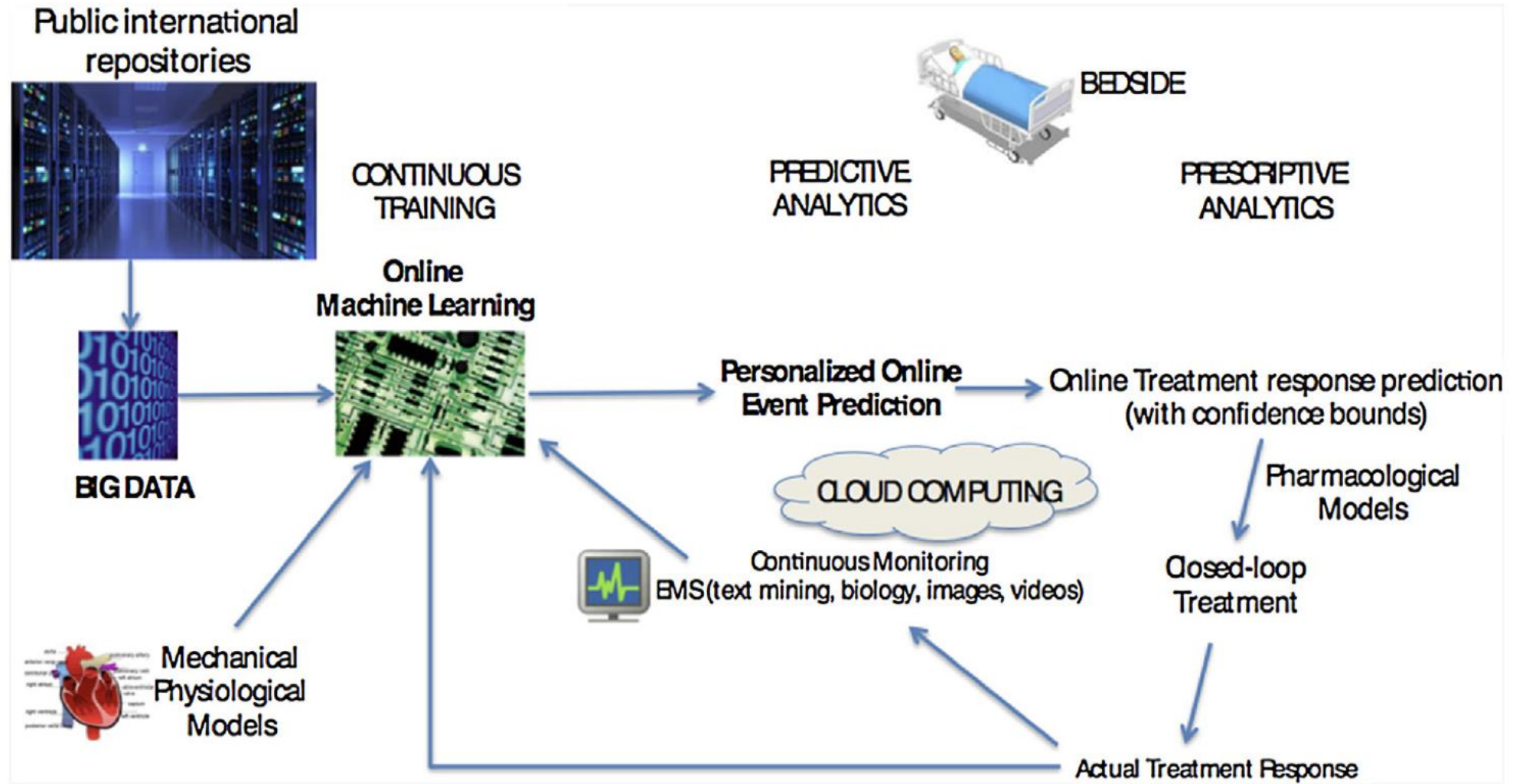
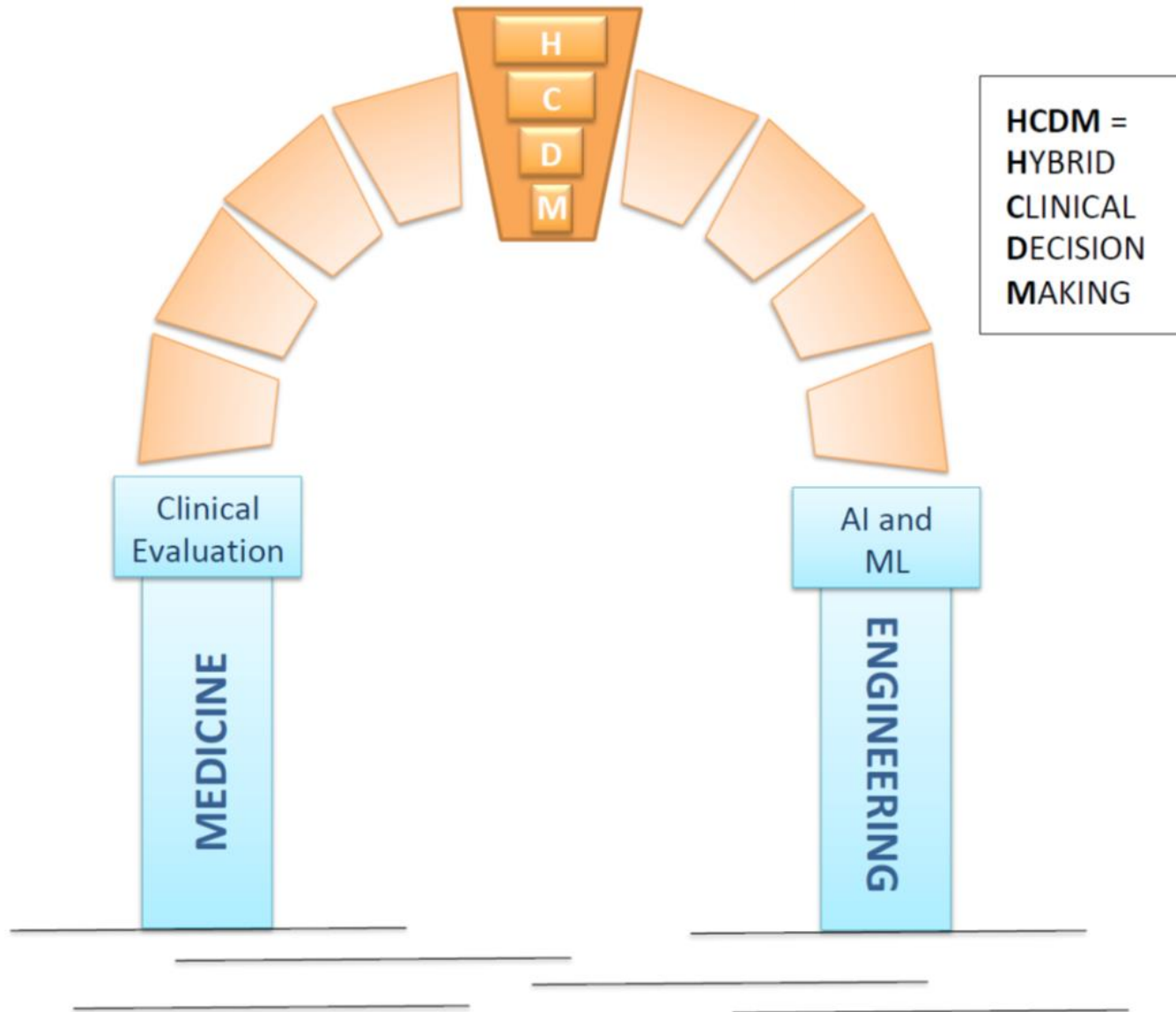


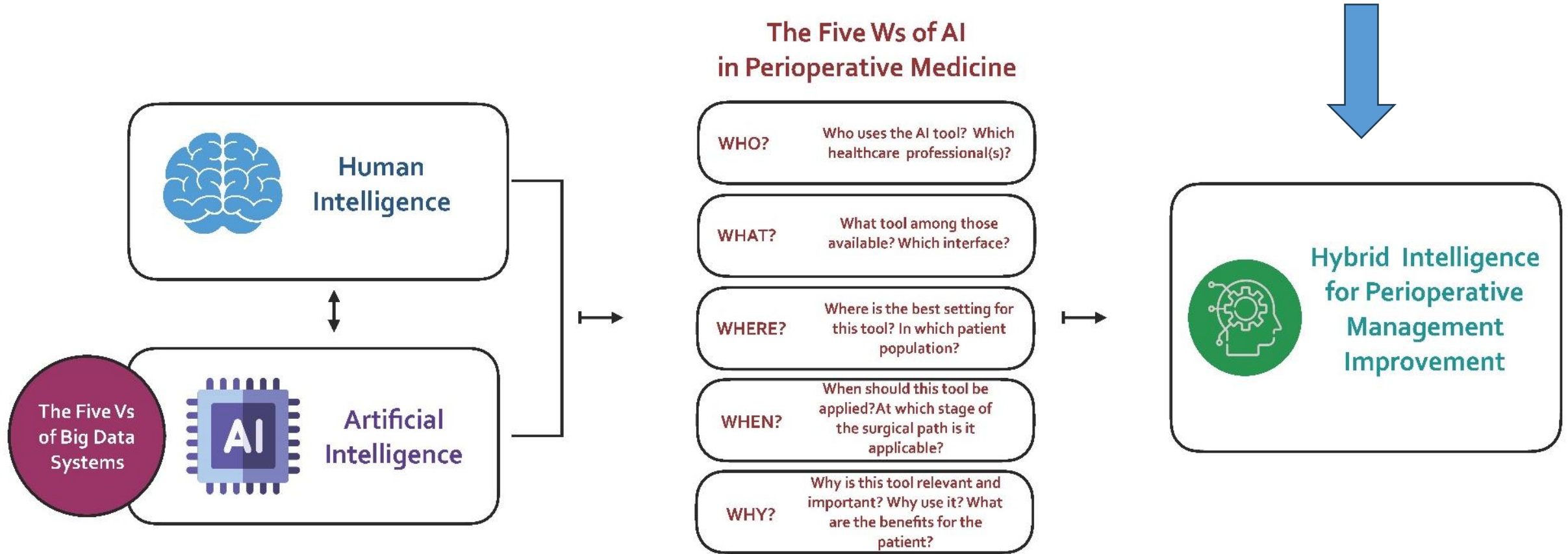
Fig. 4. Forthcoming architecture for personalized online predictive and prescriptive analytics in acute care.

Artificial intelligence in anesthesia: an uphill but inevitable road

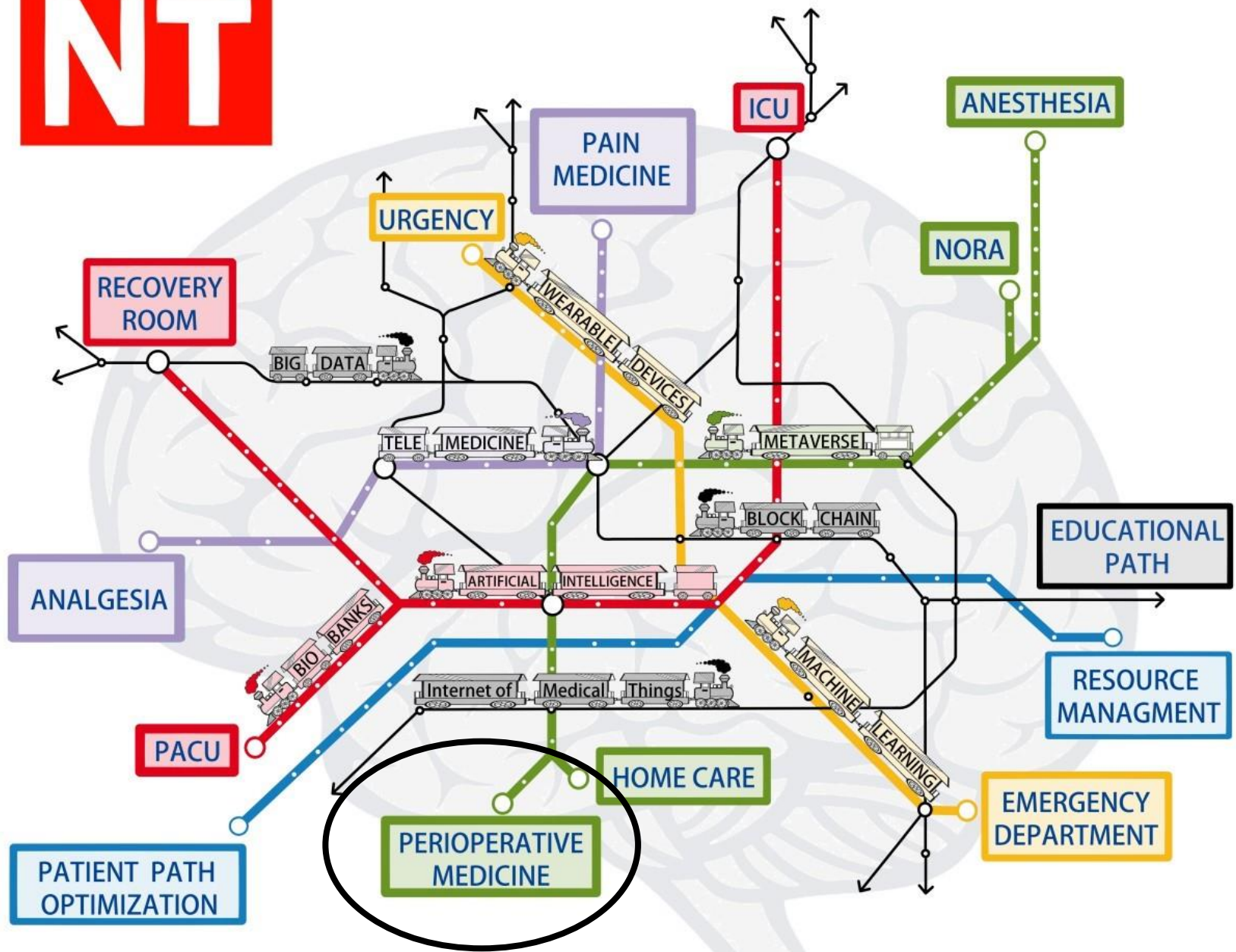
--Manuscript Draft--

Bignami E, Canadian journal of Anesthesia, 2023





NT





Monitoring Postoperative Hypotension – A Futuristic Look at Patient Safety

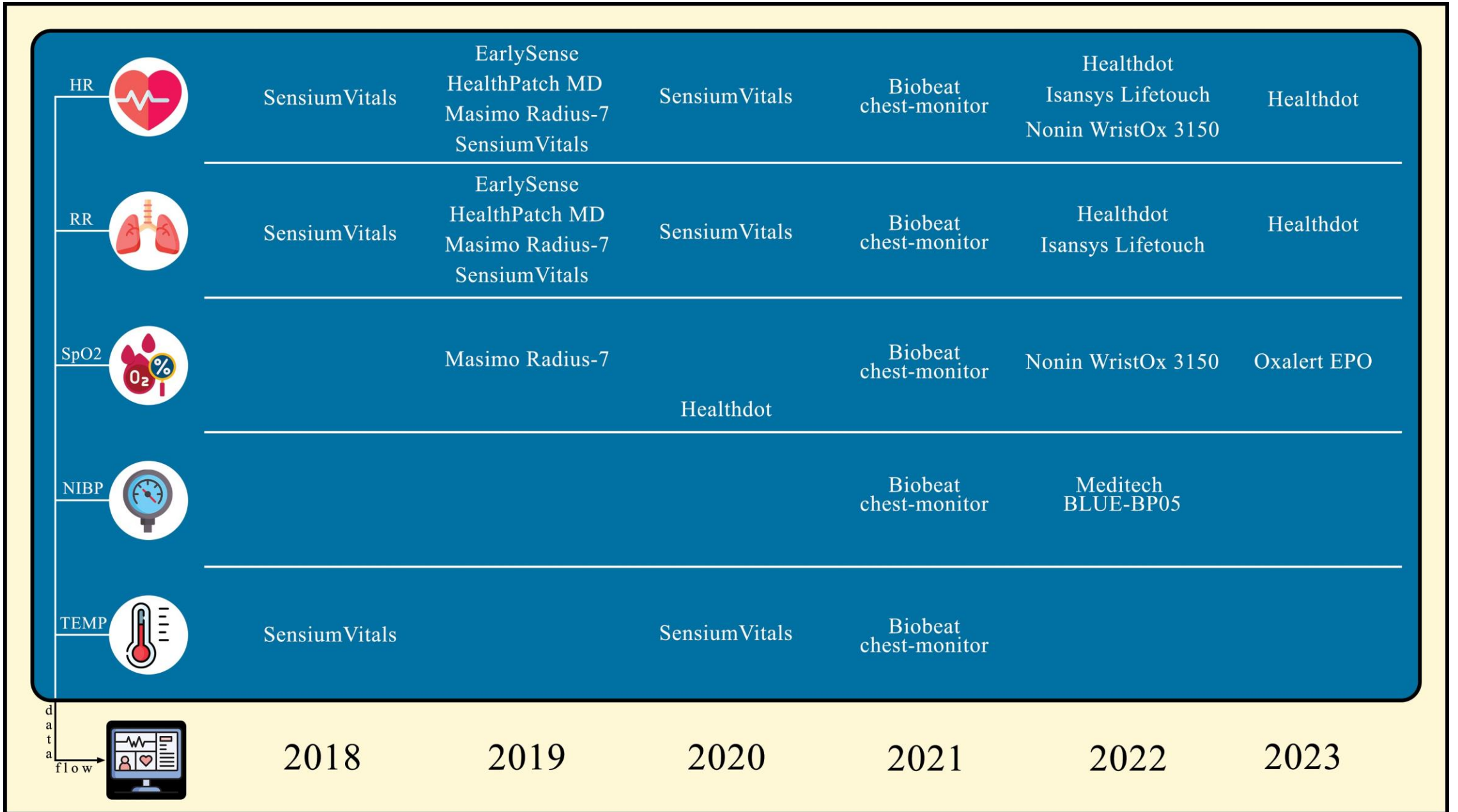


Utility of Wearable Sensors to Assess Postoperative Recovery in Pediatric Patients After Appendectomy

Christopher De Boer, MD, MS,^{a,*} Hassan Ghomrawi, PhD,^a
Benjamin Many, MD, MS,^a Megan E. Bouchard, MD,^a
Samuel Linton, MD,^a Angie Figueroa, MS,^a Soyang Kwon, PhD,^b
and Fizan Abdullah, MD, PhD^a

^a Division of Pediatric Surgery, Department of Surgery, Northwestern University Feinberg School of Medicine, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, Illinois

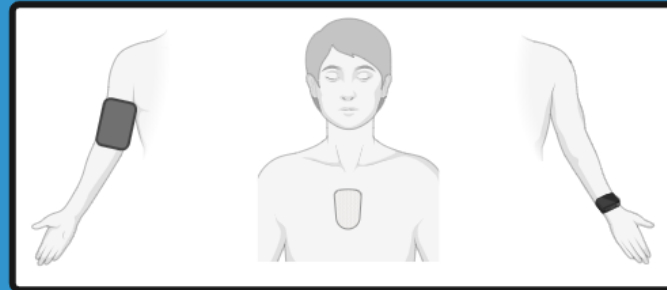
^b The Smith Child Health Research Program, Ann and Robert H. Lurie Children's Hospital of Chicago, Chicago Illinois



P A R A M E T E R S



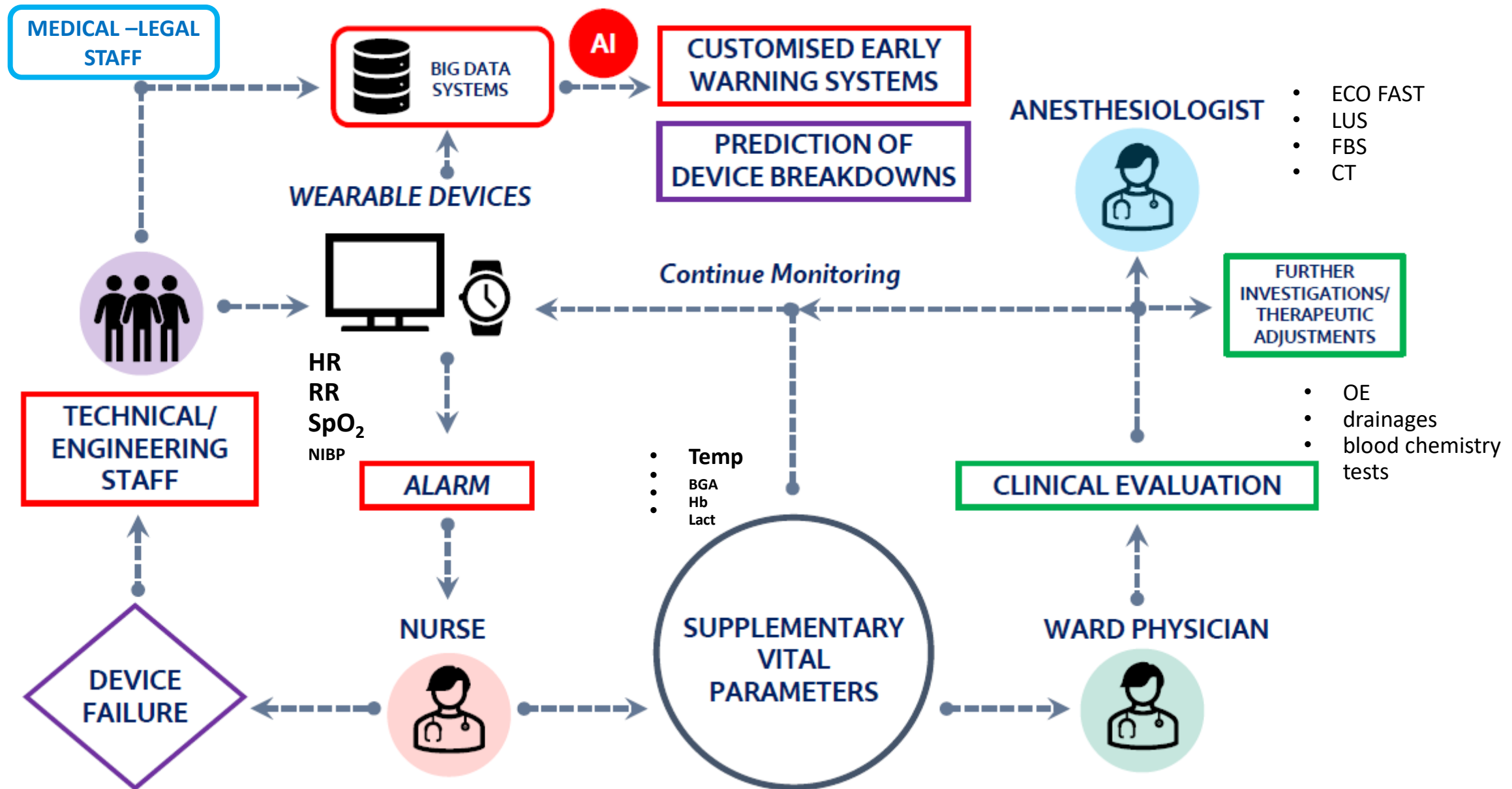
WEARABLE SENSORS



AI BASED SOFTWARE



MEDICAL EARLY
WARNING SYSTEM











Monitoraggi smart e intelligenti da usare in Recovery Room e reparti degenza



Article

Validity and Reliability of Wearable Sensors for Continuous Postoperative Vital Signs Monitoring in Patients Recovering from Trauma Surgery

Rianne van Melzen ^{1,*} , Marjolein E. Haveman ^{2,*} , Richte C. L. Schuurmann ¹ , Kai van Amsterdam ² ,
Mostafa El Moumni ³ , Monique Tabak ⁴ , Michel M. R. F. Struys ²  and Jean-Paul P. M. de Vries ¹ 

Ottobre 2024

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 - ² Department of Anesthesiology, University Medical Center Groningen, University of Groningen, 9713 GZ Groningen, The Netherlands
 - ³ Department of Surgery, Division of Trauma Surgery, University Medical Center Groningen, University of Groningen, 9713 GZ Groningen, The Netherlands
 - ⁴ Department of Biomedical Signals and Systems, University of Twente, 7500 AE Enschede, The Netherlands
- * Correspondence: r.van.melzen@umcg.nl (R.v.M.); m.e.haveman@umcg.nl (M.E.H.);
Tel.: +316-25-65-13-91 (R.v.M.)



Validity and Reliability of Wearable Sensors for Continuous Postoperative Vital Signs Monitoring in Patients Recovering from Trauma Surgery

Rianne van Melzen ^{1,*}, Marjolein E. Haveman ^{2,*}, Richta C. L. Schuurmann ¹, Kai van Amsterdam ², Mostafa El Mounni ³, Monique Tabak ⁴, Michel M. R. F. Struys ² and Jean-Paul P. M. de Vries ¹

- ¹ Department of Surgery, Division of Vascular Surgery, University Medical Center Groningen, University of Groningen, 9713 GZ Groningen, The Netherlands; j.p.p.m.de.vries@umcg.nl (J.-P.P.M.d.V.)
 - ² Department of Anesthesiology, University Medical Center Groningen, University of Groningen, 9713 GZ Groningen, The Netherlands
 - ³ Department of Surgery, Division of Trauma Surgery, University Medical Center Groningen, University of Groningen, 9713 GZ Groningen, The Netherlands
 - ⁴ Department of Biomedical Signals and Systems, University of Twente, 7500 AE Enschede, The Netherlands
- * Correspondence: r.van.melzen@umcg.nl (R.v.M.); m.e.haveman@umcg.nl (M.E.H.); Tel.: +316-25-65-13-91 (R.v.M.)

VitalPatch™



Radius PPG™
e Radius T™



Valide soluzioni per il *telemonitoraggio* di **SpO2** e **frequenza cardiaca** dei pazienti traumatici dopo un intervento chirurgico (in Recovery Room)

Predictive

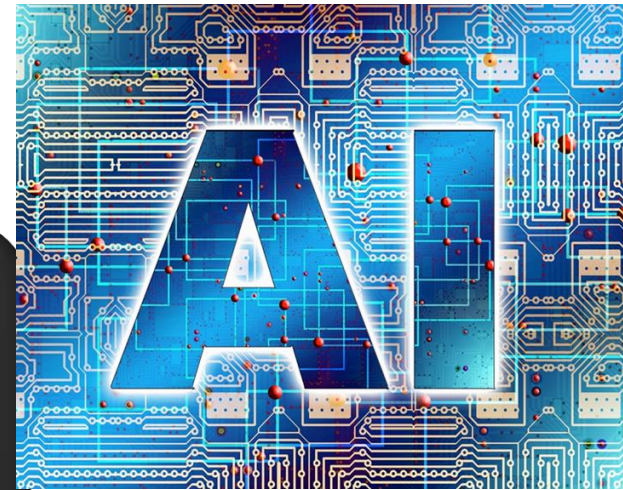
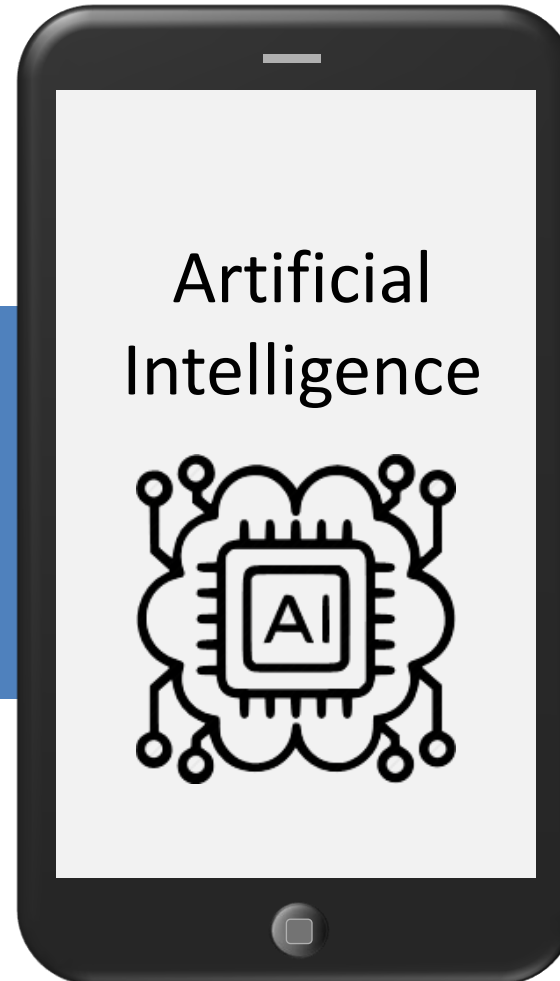
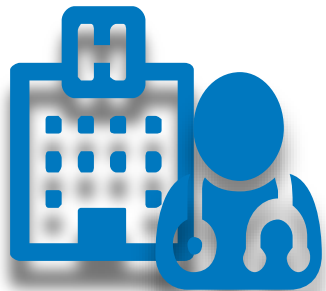
Black Box

Explainable AI

Interpretability

ML, DL

.....



Generative

- Chatbot
- *LLM/NPL*
- ...

AI → Chat GPT e dintorni



Un CHATBOT è un programma che **simula la conversazione con utenti finali umani**, spesso utilizzando la **NLP** (*Natural Language Processing*) per analizzare gli input e **l'Intelligenza Artificiale generativa** per automatizzare le risposte

Google
Bard

↓
Gemini



ChatGPT

Evaluating the Feasibility of ChatGPT in Healthcare: An Analysis of Multiple Clinical and Research Scenarios

[Marco Cascella](#), [Jonathan Montomoli](#), [Valentina Bellini](#) & [Elena Bignami](#) 

Journal of Medical Systems **47**, Article number: 33 (2023) | [Cite this article](#)

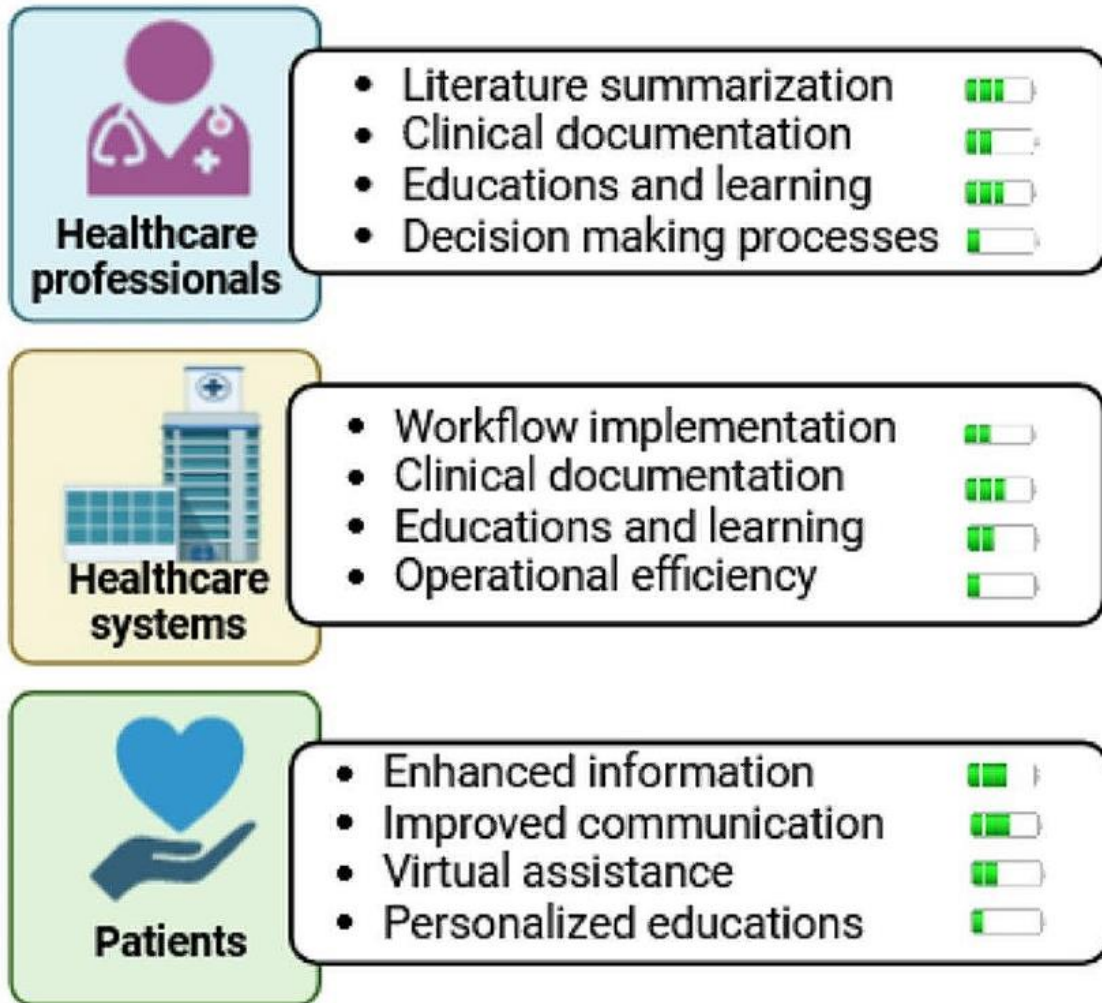
8408 Accesses | **18** Citations | **5** Altmetric | [Metrics](#)

- Possibilità di creare note mediche a partire da parametri vitali, terapia e referti. Non in grado però di trovare un nesso causale tra le patologie (es. ARDS e shock settico),
- In grado di riassumere risultati di articoli scientifici (ha creato conclusioni per 5 studi del 2022 su NEJM partendo dal testo). Priorità al senso logico rispetto al limite di parole dato,
- Ha passato con successo test complessi di natura medica (es. USMLE),

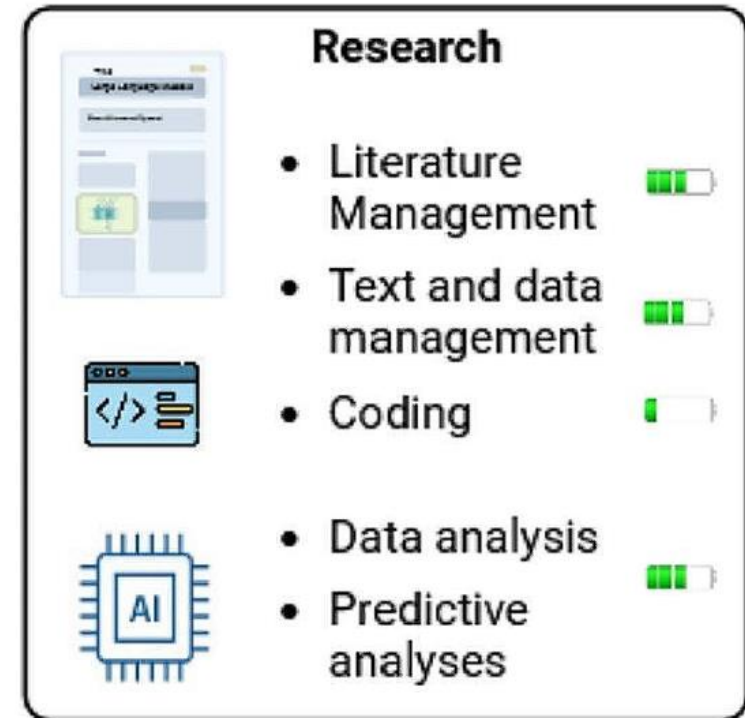


The Breakthrough of Large Language Models Release for Medical Applications: 1-Year Timeline and Perspectives

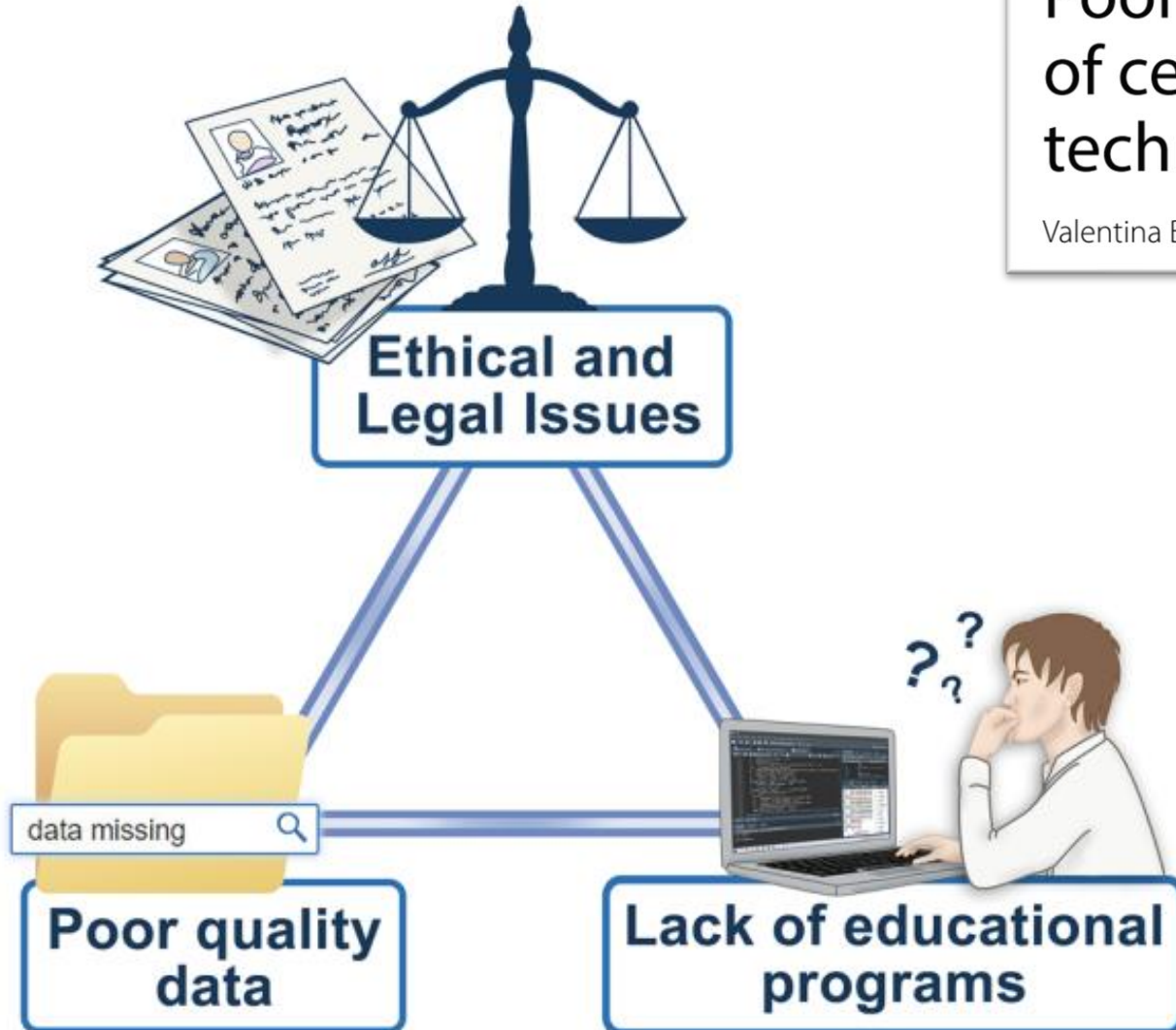
Marco Cascella¹ · Federico Semeraro² · Jonathan Montomoli³ · Valentina Bellini⁴ · Ornella Piazza¹ · Elena Bignami⁴



The battery symbol indicates the extent of current applications, ranging from one line to multiple lines



Triad of AI Death in Clinical Practice



CORRESPONDENCE

Poor quality data, privacy, lack of certifications: the lethal triad of new technologies in intensive care

Valentina Bellini¹, Jonathan Montomoli² and Elena Bignami^{1*} 

GIGO RULE

«Le performance di queste tecnologie dipendono dalla qualità dei dati secondo la regola GIGO dell'informatica»

GARBAGE IN



Garbage data



Good model



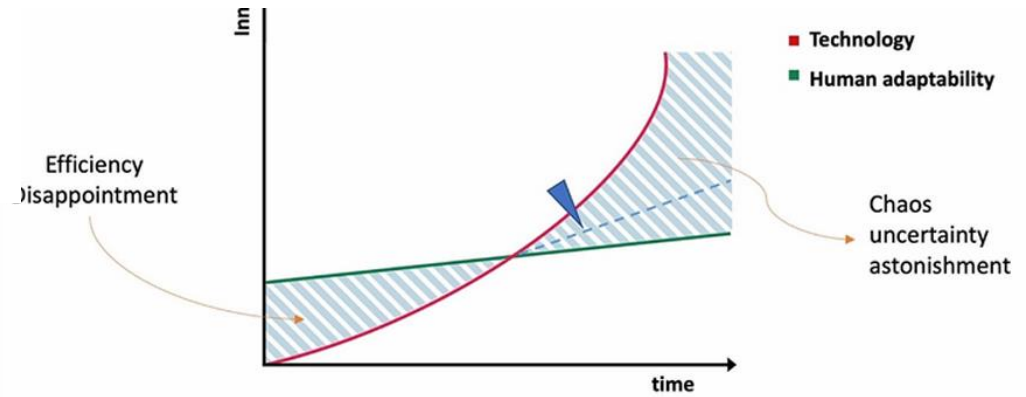
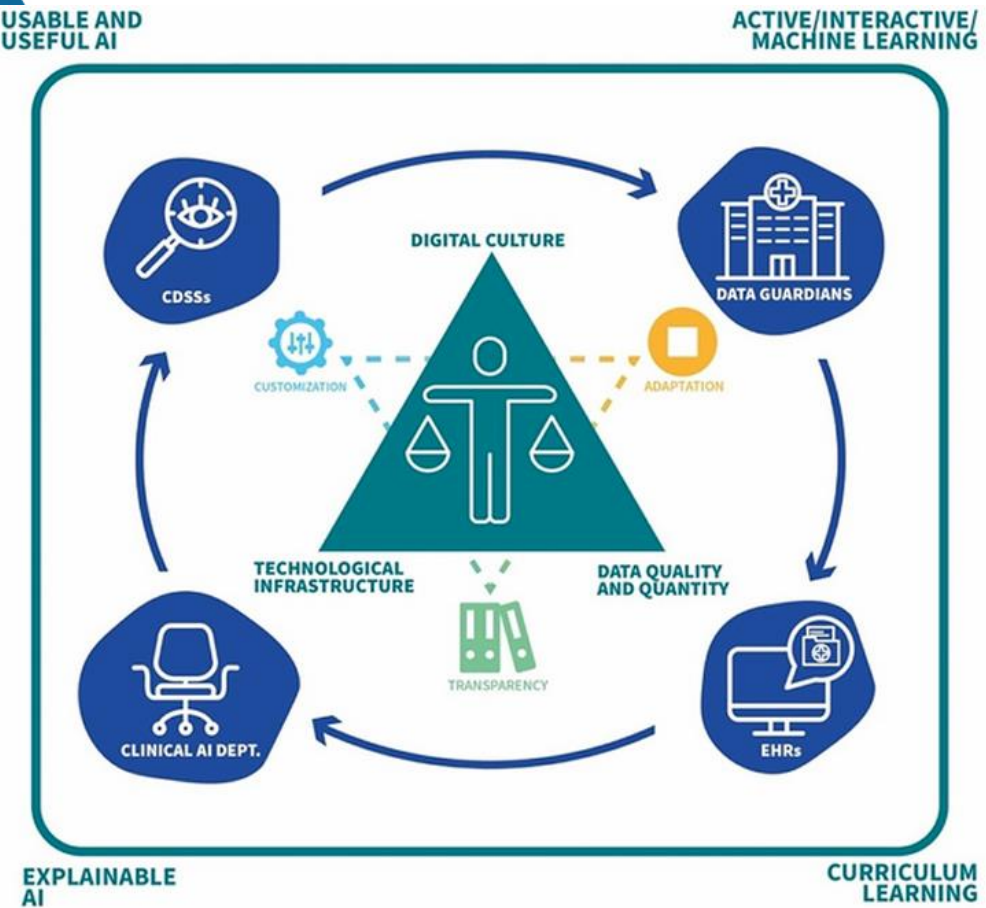
Bad output

GARBAGE OUT

Algor-ethics: charting the ethical path for AI in critical care

Jonathan Montomoli^{1,2} · Maria Maddalena Bitondo¹ · Marco Cascella³ · Emanuele Rezoagli^{4,5} · Luca Romeo⁶ ·
 Valentina Bellini⁷ · Federico Semeraro⁸ · Emiliano Gamberini¹ · Emanuele Frontoni⁹ · Vanni Agnoletti¹⁰ ·
 Mattia Altini¹¹ · Paolo Benanti¹² · Elena Giovanna Bignami⁷

J Clin Monit Comput. 2024 Apr 4.




The accelerated rate of technological advancements compared to human capacity for adaptation, could lead to potential areas of disparity and unpredictability

The future of healthcare AI lies not just in technological innovation but in its harmonious **integration with human expertise and vision**, ensuring that AI serves as a tool for timely enhancement rather than replacement, ultimately contributing to improved patient outcomes and healthcare delivery


2024: AI ACT e in sanità....



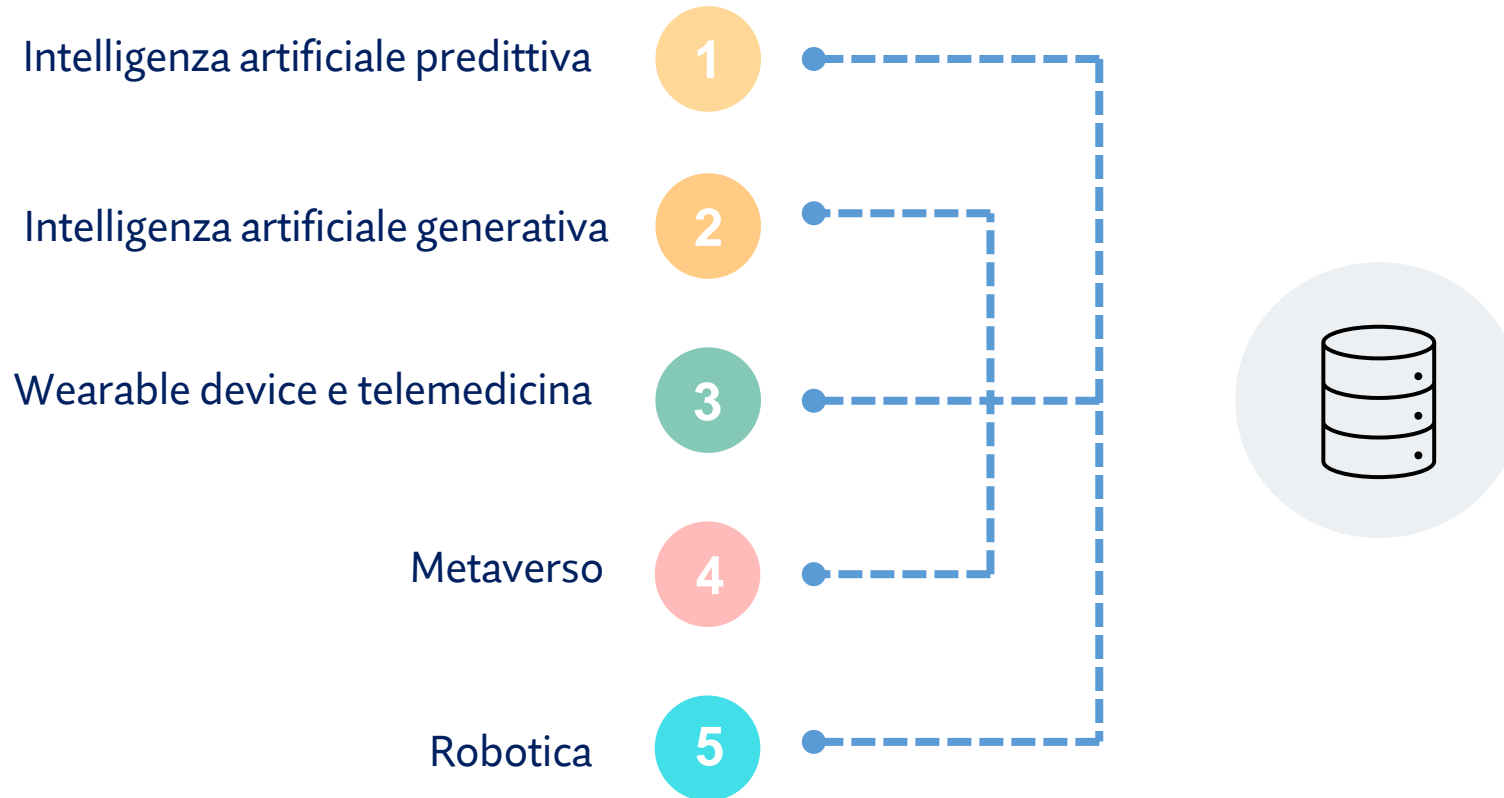
European Parliament.
Artificial Intelligence Act.
Accessed January 11, 2024.
[https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698792/EPRS_BRI\(2021\)698792_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698792/EPRS_BRI(2021)698792_EN.pdf)



La medicina peri-operatoria
del futuro: tra nuove
sfide, tecnologie e
intelligenza artificiale

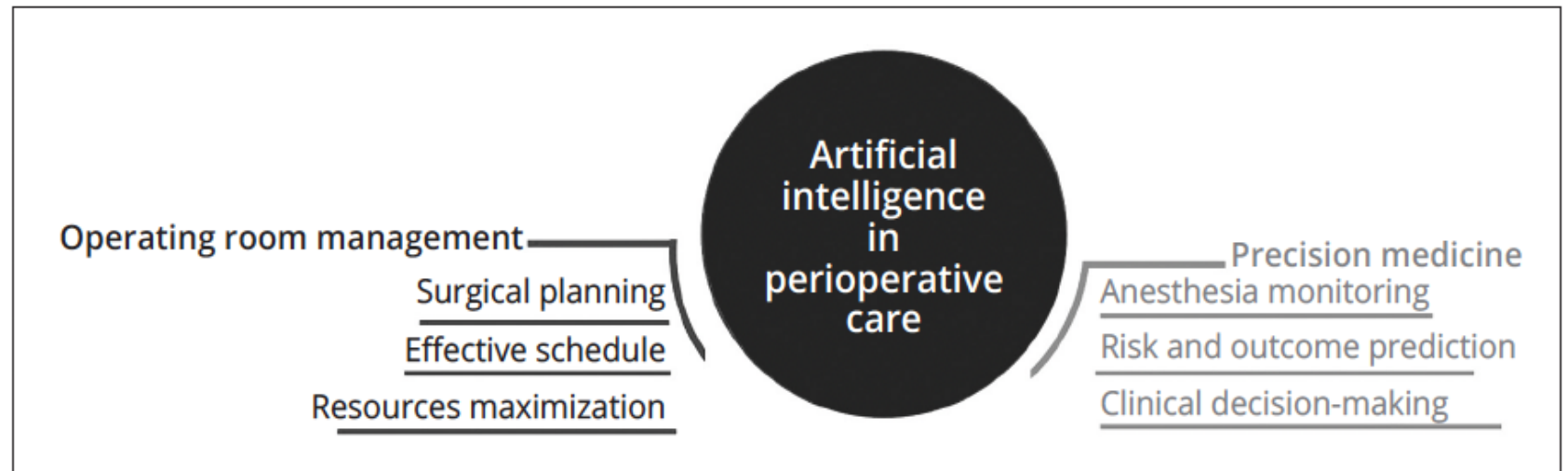


Le nuove tecnologie



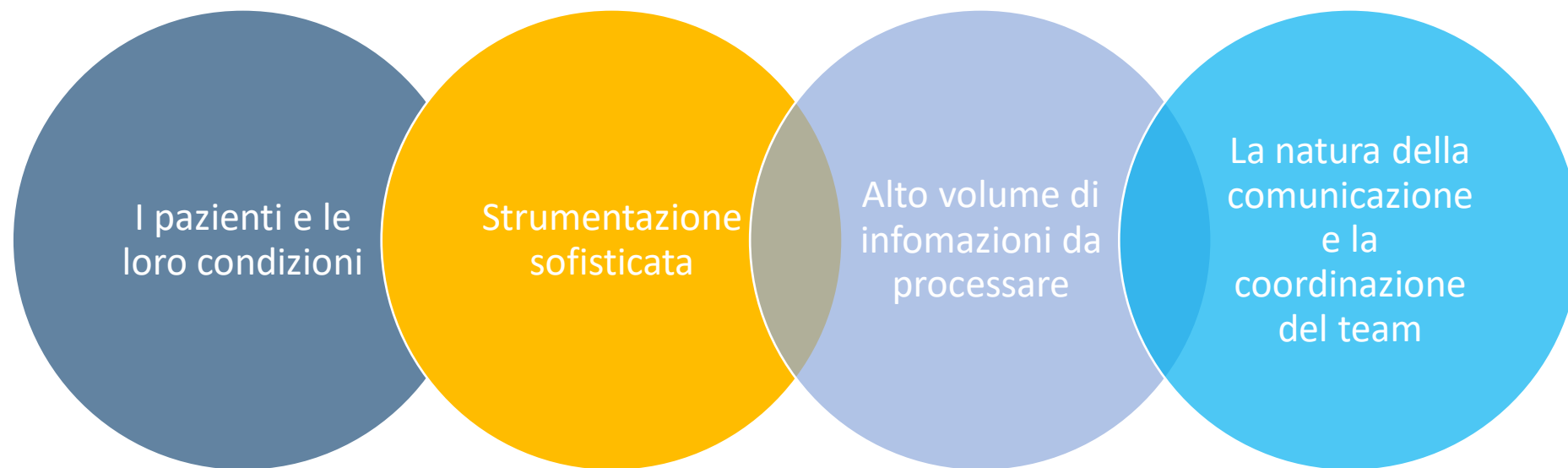
INTELLIGENZA ARTIFICIALE

Figure 1.—Role of artificial intelligence in perioperative medicine. Its role is twofold. It can be used both to optimize the organization and efficiency of the operating room, and to maximize the personalization of perioperative care.

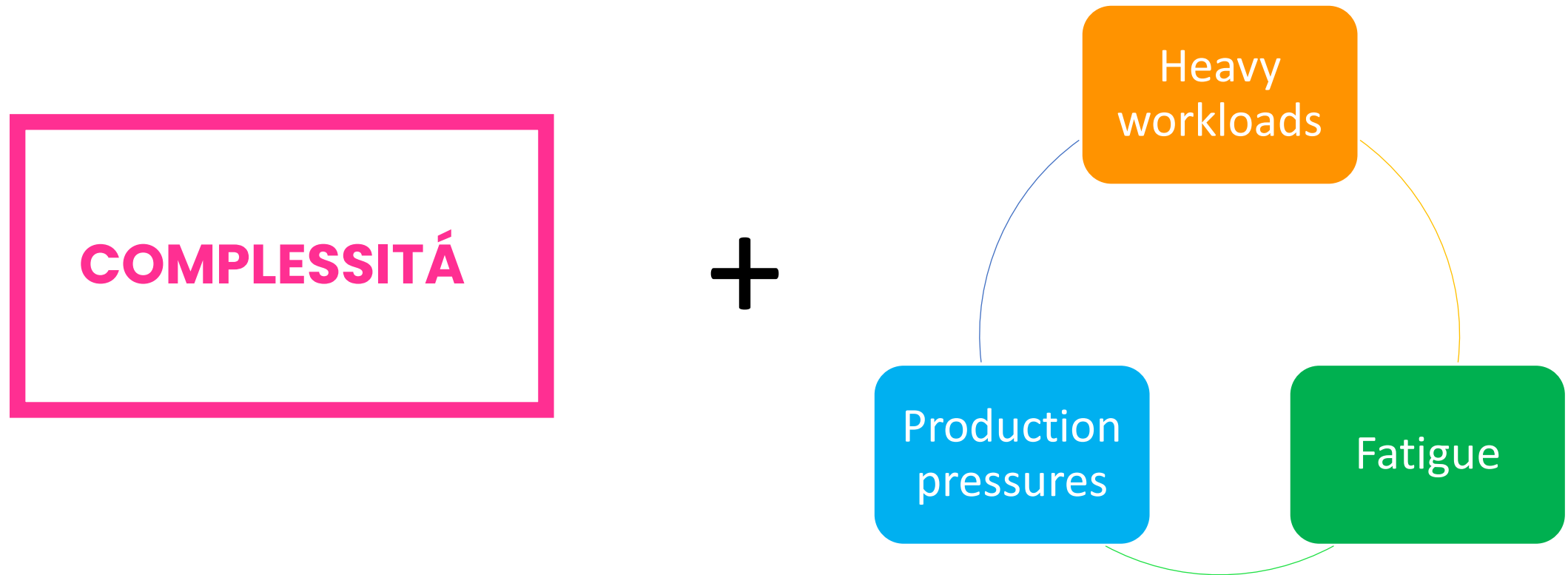


INTELLIGENZA ARTIFICIALE

La sala operatoria è un sistema straordinariamente **COMPLESSO**



La sala operatoria è considerata un ambiente VULNERABILE



REVIEW

Open Access

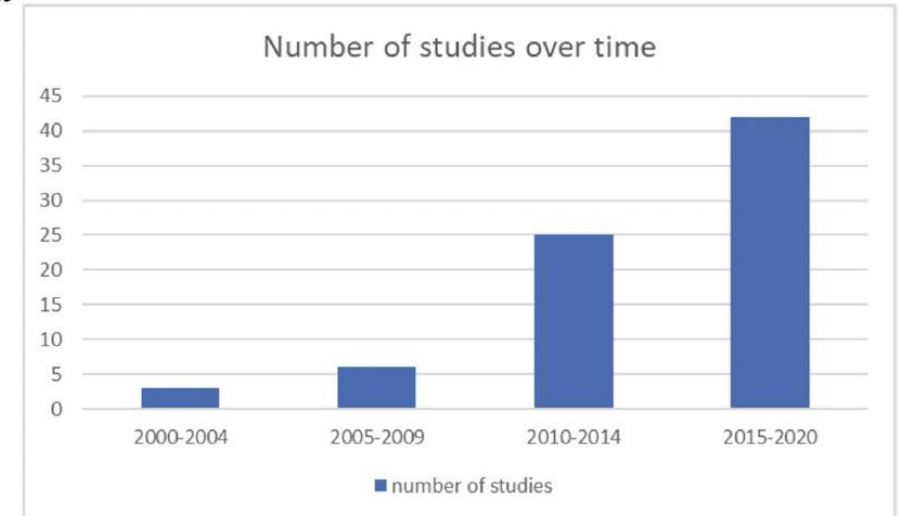
Operating room organization and surgical performance: a systematic review

Arnaud Pasquer^{1,2,5*}, Simon Ducarroz¹, Jean Christophe Lifante^{1,3,5,6}, Sarah Skinner^{1,3}, Gilles Poncet^{2,4,5} and Antoine Duclos^{1,3,5}



Nonostante la quantità limitata di studi e la loro eterogeneità, i **fattori organizzativi** sembrano svolgere un ruolo significativo negli esiti chirurgici.

a



b





INTELLIGENZA ARTIFICIALE

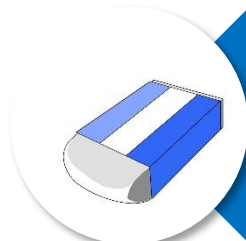
I nostri risultati mostrano come l'AI può essere impiegata con successo per tre differenti scopi:



Predizione durata chirurgica



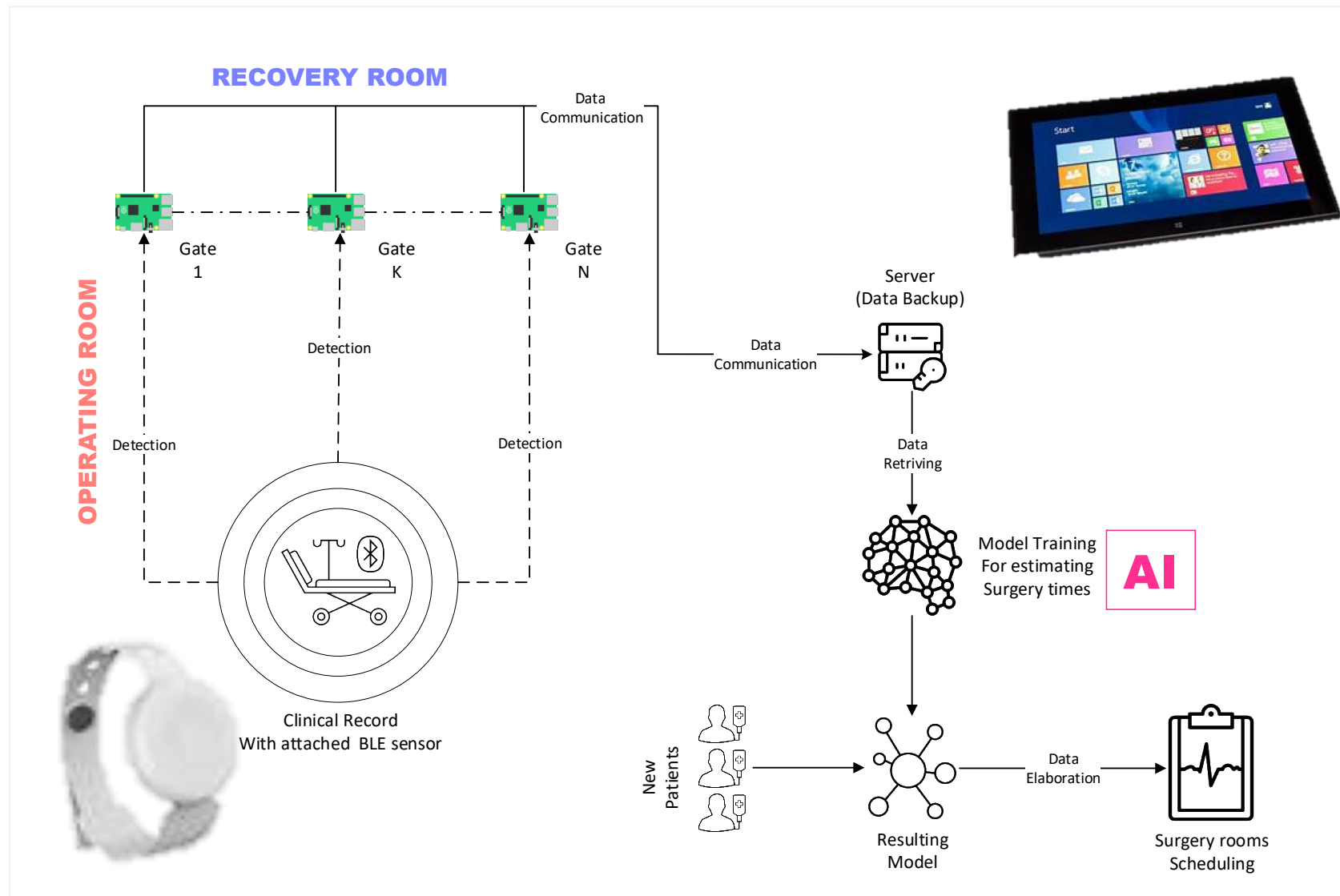
PACU LOS



Rischio cancellazione interventi

Studio BLOC-OP

(bluetooth tracking
indoor system)



I RISULTATI DELLE PRIME ANALISI

LA DIFFERENZA TRA IL TEMPO STIMATO DI OCCUPAZIONE DI SO E IL TEMPO EFFETTIVO MISURATO TRAMITE L'IoT APPARE VARIARE SECONDO ALCUNE VARIABILI:



Numero di comorbidità ($p < 0.01$)



L'età del paziente ($p = 0.03$)



BMI ($p < 0.01$)



Medical Data Recorder (MDR)[®]







Studio BLOC-OP



Funded by
the European Union
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Future
Artificial
Intelligence
Research

Bando a Cascata Partenariato Esteso “Future Artificial Intelligence Research (FAIR)” PE00000013



**UNIVERSITÀ
DI PARMA**



intellico

From data to sustainable value

INTELLIGENZA ARTIFICIALE



IMPLEMENTAZIONE CLINICA

- ✓ I dati impiegati devono essere di qualità elevata processati molto velocemente
- ✓ Sono necessari un maggior numero di studi di validazione esterna
- ✓ Gli output dovrebbero essere disponibili in sala operatoria o al letto del paziente e si devono integrare con i sistemi informativi locali
- ✓ Impiegare tecniche di explainable AI, qualora possibile, per rendere gli output maggiormente comprensibili

SISTEMI INDOSSABILI



Wearable wireless continuous vital signs monitoring on the general ward

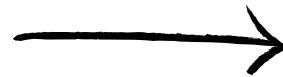
Jobbe PL. Leenen^{a,b}, Lisette Schoonhoven^{c,d} and Gijs A. Patijn^{a,e}



I sensori e i dispositivi includono tipicamente cerotti, braccialetti o altri piccoli dispositivi che possono essere indossati comodamente dai pazienti.

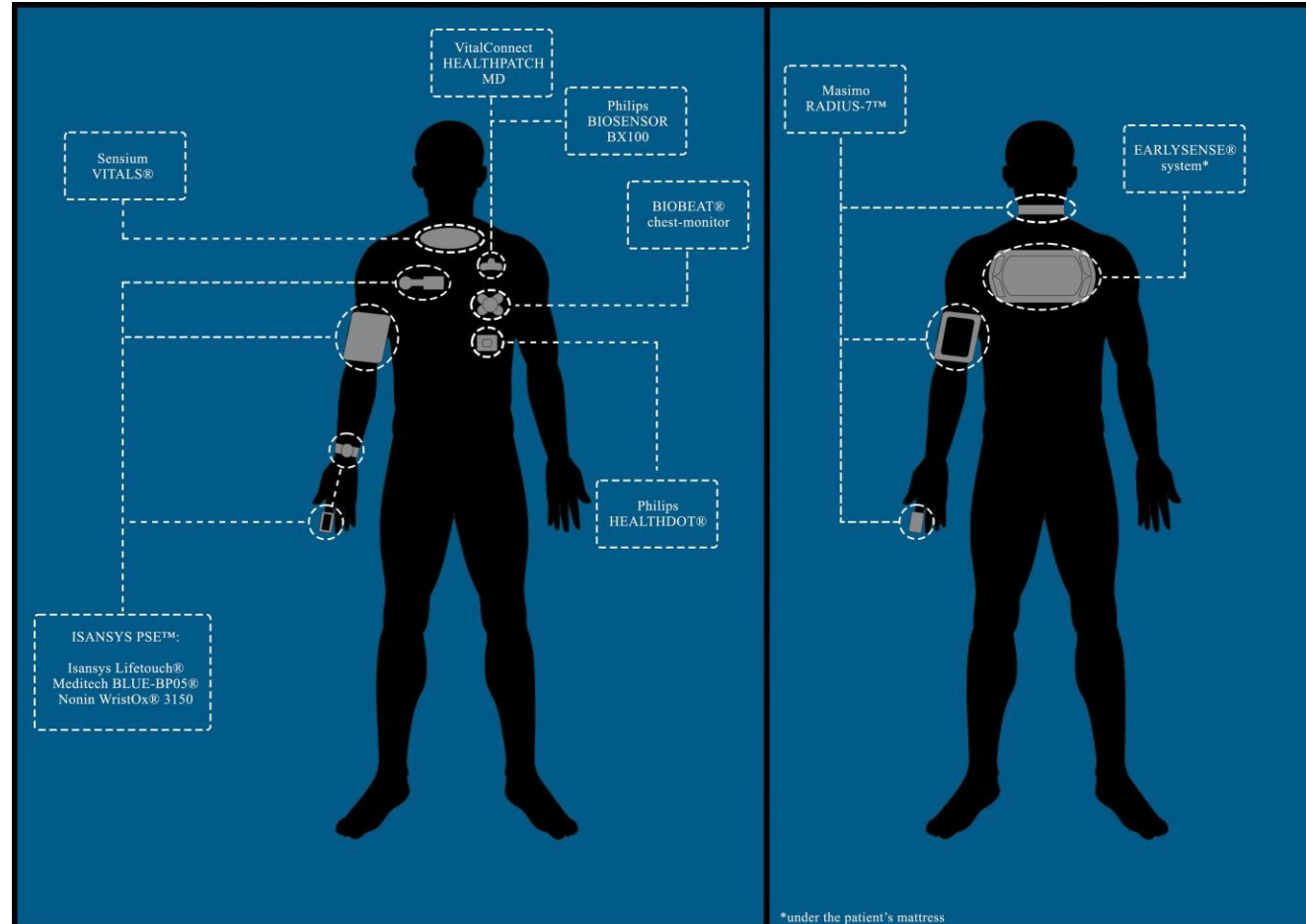
Utilizzano vari sensori per catturare continuamente i dati relative ai parametri vitali.

I sensori wireless indossabili per il monitoraggio continuo dei segni vitali (CVSM) offrono il potenziale per l'identificazione precoce del deterioramento del paziente



Impatto sugli esiti: riduzione dei ricoveri in terapia intensiva, delle complicanze, della mortalità e della durata della degenza dei pazienti ricoverati.

SISTEMI INDOSSABILI



Bignami et al. *Journal of Clinical Monitoring and Computing*.
ACCEPTED 2024

SISTEMI INDOSSABILI



**UNIVERSITÀ
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DIPARTIMENTO DI MEDICINA E CHIRURGIA

Protocollo di studio

“Real-time Evaluation and Continuous Observation of Vital signs for Enhanced Recovery (RECOVER) “



SISTEMI INDOSSABILI

Protocollo di studio

“Real-time Evaluation and Continuous Observation of Vital signs for Enhanced Recovery (RECOVER) “

Comparazione tra i 2
gruppi: **gold standard**
vs monitoraggio
con i nuovi **sistemi**
indossabili

- *Numero eventi* **desaturazione**
- *Numero eventi di* **tachipnea**
- *Numero eventi di* **instabilità emodinamica**

SISTEMI INDOSSABILI

IMPLEMENTAZIONE CLINICA

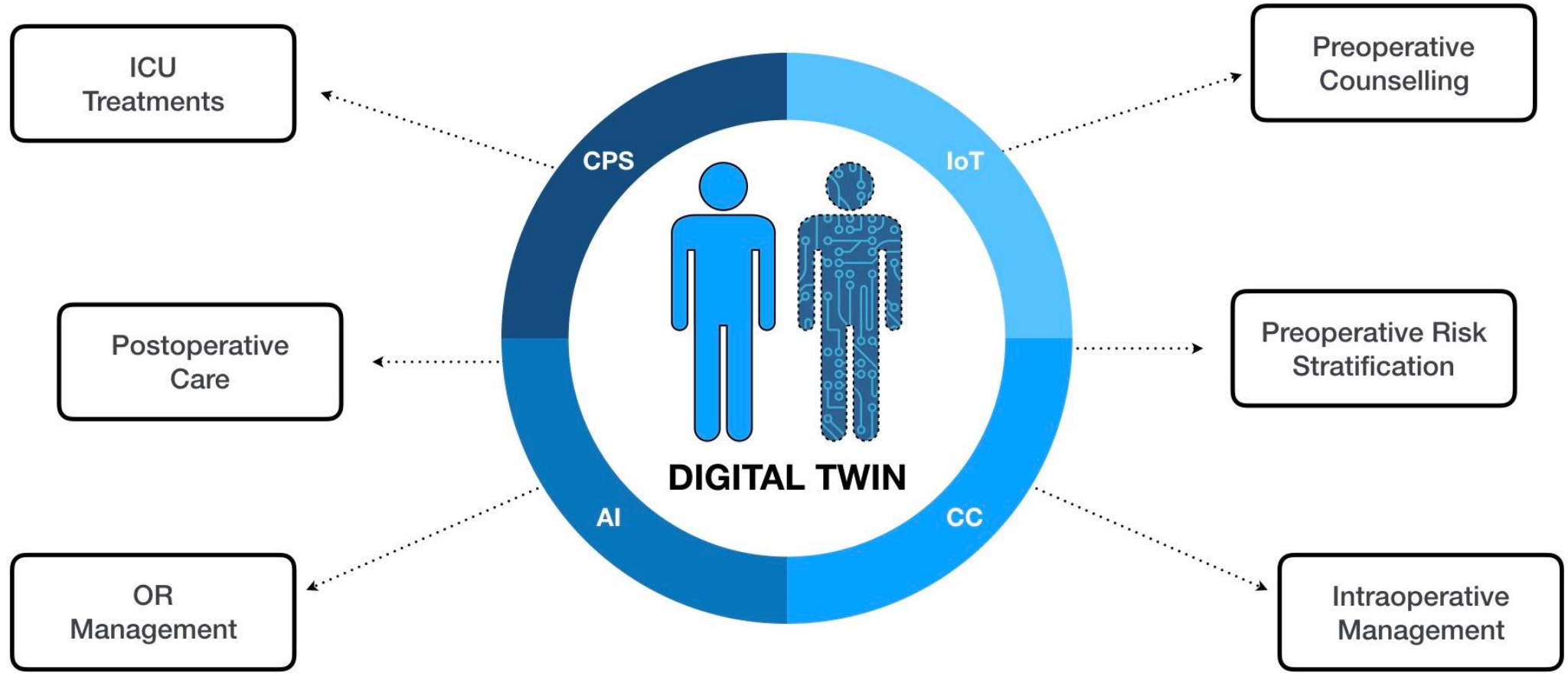
- ✓ L'integrazione con i sistemi informativi locali
- ✓ Analisi costi/benefici
- ✓ Mantenere la paternità dei dati
- ✓ Approfondire le tipologie esistenti per individuare quelle maggiormente conformi alle nostre esigenze



METAVERSO

“Un metaverso è uno spazio collettivo virtuale condiviso, creato dalla convergenza di realtà fisiche e digitali potenziate virtualmente”.



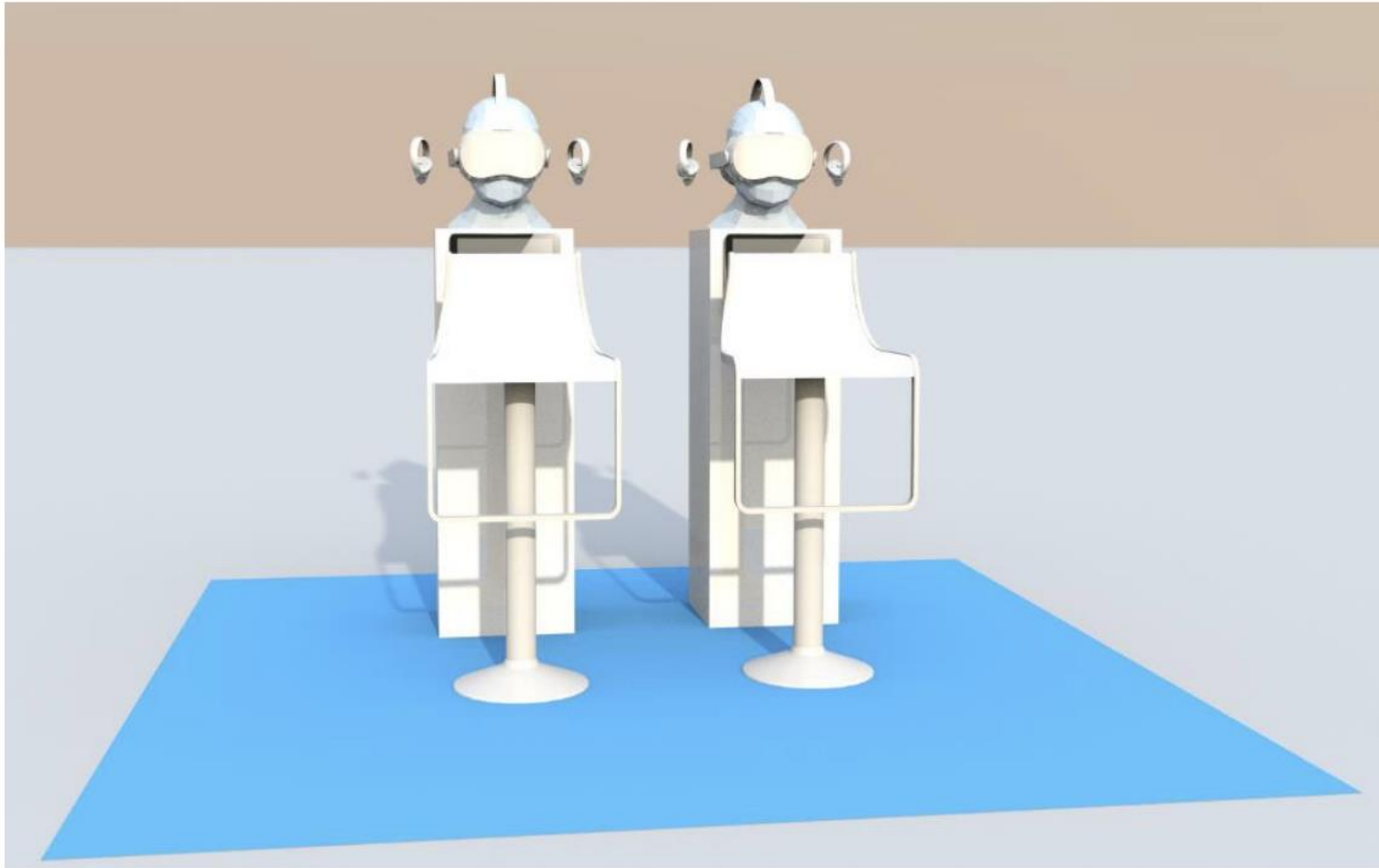


Il gemello digitale è definito come una rappresentazione digitale di un'entità o di un sistema reali

Progetto “INSIEME”

Creazione di una esperienza immersiva che guida il paziente in un tour virtuale dell'intero comparto operatorio, permettendogli di esplorare l'ambiente, conoscere il team che lo avrà in cura e ricevere una panoramica delle procedure, chirurgiche e non, cui sarà sottoposto.

METAVERSO



Progetto “INSIEME”



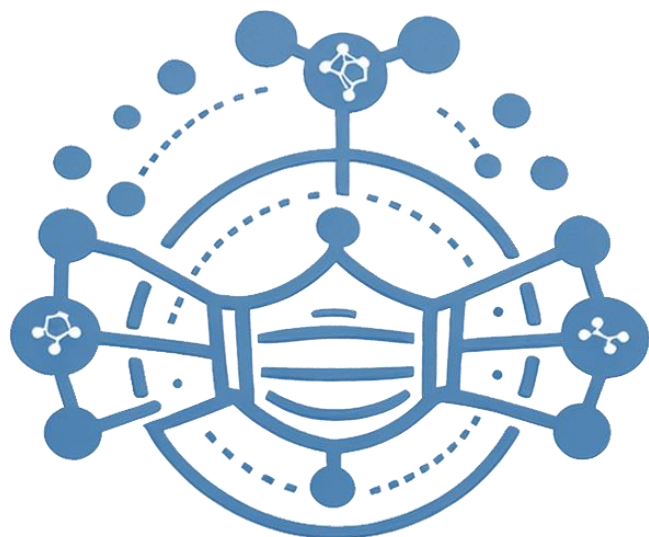
METAVERSO



- ✓ La creazione di gemelli digitali di ospedali/reparti potrebbe essere fondamentale per creare scenari di flusso di lavoro paralleli per ottimizzare le risorse disponibili.
- ✓ Inoltre, i gemelli digitali consentirebbero simulazioni accurate di diversi schemi organizzativi per arrivare a quello ottimale, evitando così tentativi nella vita reale che potrebbero compromettere la qualità del servizio offerto.

POTENZIALITÀ APPLICATIVE

Istruzione e formazione



INSIEME

EMPOWERMENT DEL PAZIENTE

Viaggio virtuale per il
paziente nel comparto
operatorio
dell'AOU di Parma



REALE



VIRTUALE





REALE



VIRTUALE





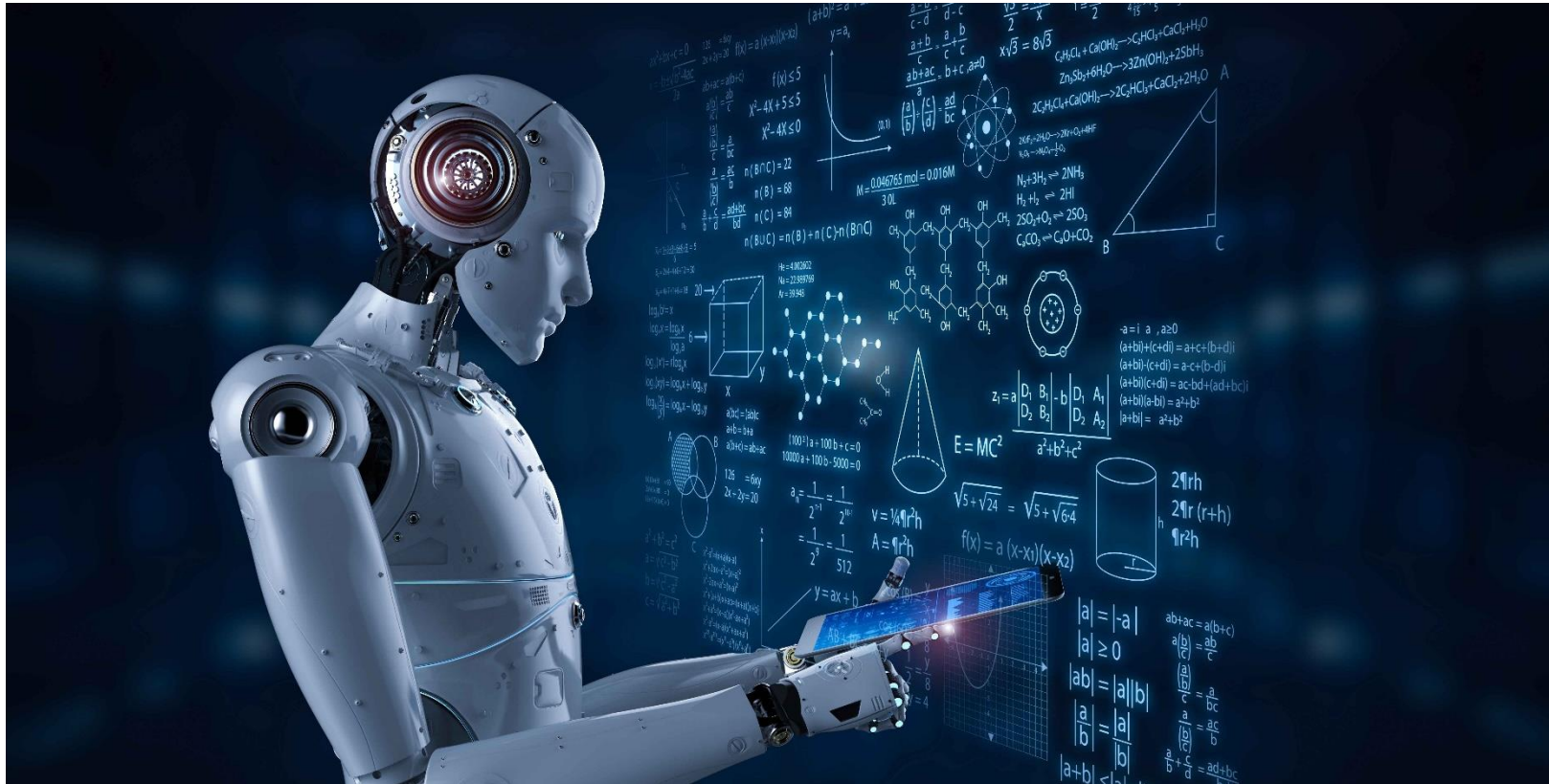
REALE



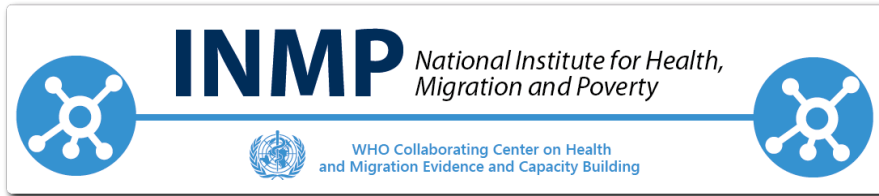
VIRTUALE



ROBOTICA



ROBOTICA



SAPIENZA
UNIVERSITÀ DI ROMA



**UNIVERSITÀ
DI PARMA**



ROBOTICA

BART

(Big data, Artificial Intelligence, Robotics and Telemedicine)



HEAD with 360° rotation function to be able to explore the entire environment.

EYES with high resolution cameras to be able to capture every detail of the patient in real time, providing high quality visual information to the control room.

EARS equipped with highly sensitive microphones to collect sound signals and interact with the patient remotely.

MOUTH with speaker to facilitate contactless communication between the control room and the patient.

AERIAL with different technologies (wifi, bluetooth, blockchain) to acquire data from the monitors and the patient.

MECHANICAL ARMS with independent movement and thermal sensors.

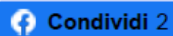
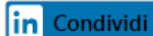
HANDS with knob rotation and button pressing functions.

CHEST with touch screen monitor for real time bilateral interaction between doctor and patient.

ABDOMEN with drawer that can be opened remotely to provide the patient with drugs, meal and other materials.

ELEVATING BASE with wheels that allow stability and 360° movement and cameras for monitoring drainage and diuresis.

Tweet



stampa

Fascicolo sanitario elettronico. “Serve riforma urgente”. L’appello di Sit, Anorc, Cnr-Irpps e Siaarti

Società scientifiche e associazioni hanno deciso di unire le forze perché l’Fse è una delle chiavi della Telemedicina, “che con un sistema informativo funzionante e dati di qualità può abbattere le ospedalizzazioni, anche nelle terapie intensive, in misura rilevante”. Può essere insomma una delle armi per affrontare la crisi di sistema resa ancor più evidente dalla pandemia, e che si manifesterà ulteriormente nei prossimi mesi per il sommarsi delle cronicità post-Covid con le altre trascurate in questi due anni.

29 APR - Sul Fascicolo sanitario elettronico "serve una riforma urgentissima perché così come è oggi lo strumento pone molti problemi operativi" risultando poco utile ai cittadini e al Ssn quando potrebbe invece contribuire ad "abbattere le ospedalizzazioni, anche nelle terapie intensive, in misura rilevante". E' l'appello congiunto di Sit, Anorc, Cnr-Irpps e Siaarti, lanciato oggi con una conferenza stampa.

L'importanza della reingegnerizzazione dell'Fse, l'ha ricordata anche **Flavia Petrini**, presidente Siaarti: "Le nuove tecnologie digitali- ha detto- sono indispensabili anche per ridurre la pressione sulle strutture di ricovero ed in parte quella sul personale sanitario. Sia per la Medicina Perioperatoria, le Reti di Terapia Dolore e Cure Palliative ed a maggior ragione per le Cure Intensive e l'assistenza alle criticità in emergenza". Secondo la presidente, il Fascicolo Sanitario Elettronico può essere "l'anello di congiunzione nella progettualità digitale fra Medici di medicina generale, pediatri e specialisti del Ssn".



Società Italiana Telemedicina



[ISCRIVITI ALLA NOSTRA NEWS LETTER](#)

Ogni giorno sulla tua mail tutte le notizie di Quotidiano Sanità.

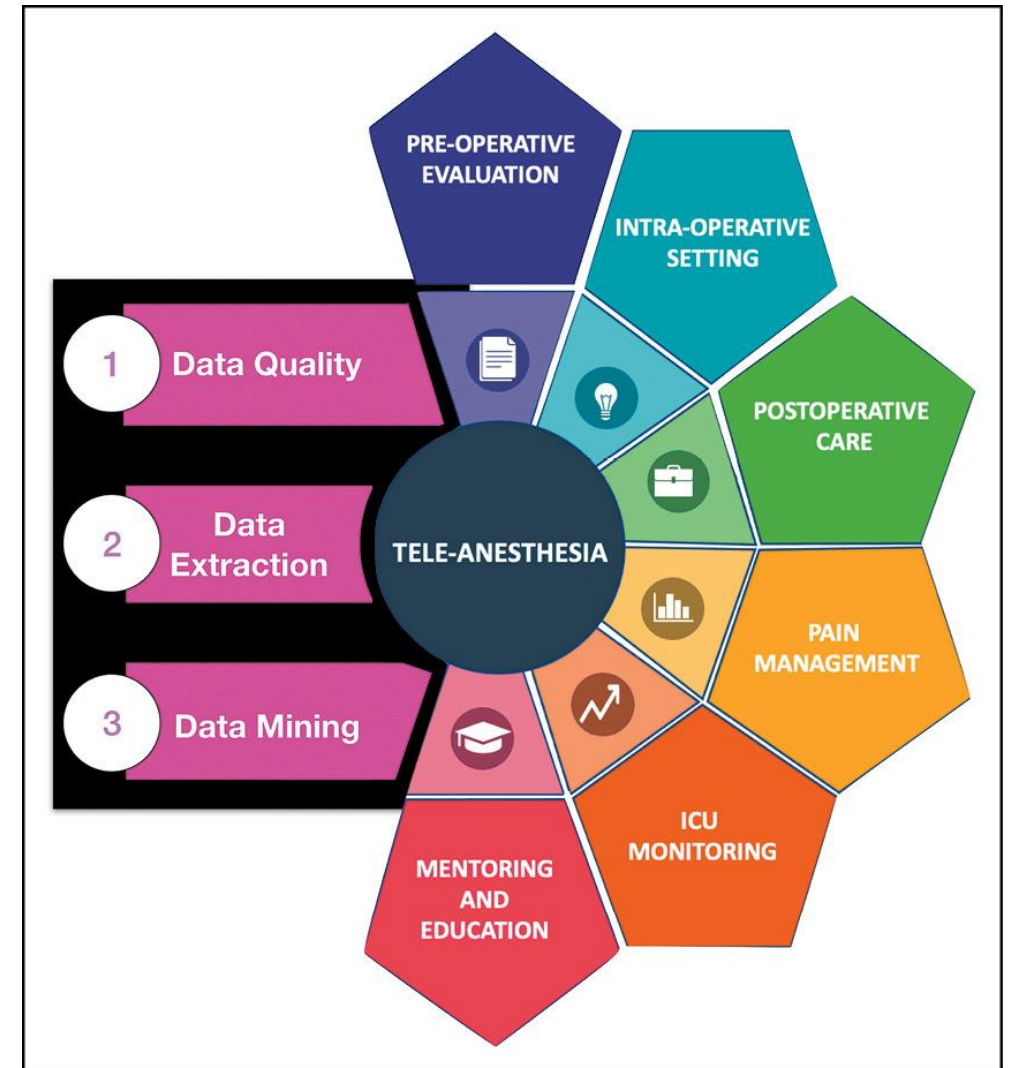
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Online version at <https://www.minervamedica.it>

Minerva Anestesiologica 2022 September;88(9):729-34
DOI: 10.23736/S0375-9393.21.16241-8

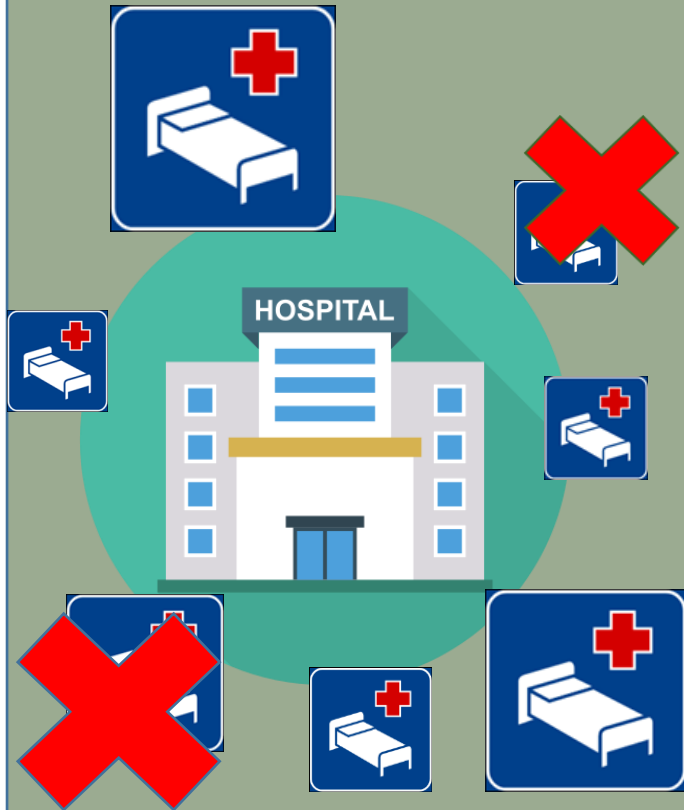
REVIEW

Artificial intelligence and telemedicine in anesthesia: potential and problems

Valentina BELLINI ¹, Marina VALENTE ², Antonio V. GADDI ³,
Paolo PELOSI ^{4,5}, Elena BIGNAMI ^{1*}



Where we are...In Italy



Intelligenza artificiale e machine learning: dal territorio alla media e alta intensità di cura in Italia

Elena Giovanna Bignami ■ *Direttore UO 2^a Anestesia e Rianimazione, AOU di Parma*

Valentina Bellini ■ *Dirigente Medico Anestesia e Rianimazione, AOU di Parma*

Antonino Giarratano ■ *Presidente della Società Italiana di Anestesia, Analgesia, Rianimazione e Terapia Intensiva (SIAARTI)
2022-2024, Palermo*

Andrea Cortegiani ■ *Professore Associato di Anestesia e Rianimazione, Università degli Studi di Palermo*

Giovanni Rinaldi ■ *Vice Presidente Comitato Tecnico Scientifico Società Italiana di Telemedicina, Bologna*

Massimo Antonelli ■ *Direttore della UOC di Rianimazione, Terapia Intensiva e Tossicologia Clinica, Università Cattolica del
Sacro Cuore, Roma*

Stefano Romagnoli ■ *Direttore SODC Anestesia Oncologica e Terapia Intensiva, AOU Careggi, Firenze*

Giacomo Grasselli ■ *Responsabile UO Terapia Intensiva Adulti, Fondazione IRCCS Ca' Granda, Ospedale Maggiore Policlinico,
Milano*



FASCICOLO SANITARIO ELETTRONICO NAZIONALE

Progetto Nazionale

Fascicolo Sanitario Elettronico (FSE) nazionale, capace di memorizzare, gestire ed analizzare le informazioni sanitarie di ciascun paziente derivanti da un numero sempre crescente di fonti, includendo l'intero percorso PERIOPERATORIO.

Nazionale
Capace di unificare le cure
sanitarie e facilitare
l'accesso alle stesse



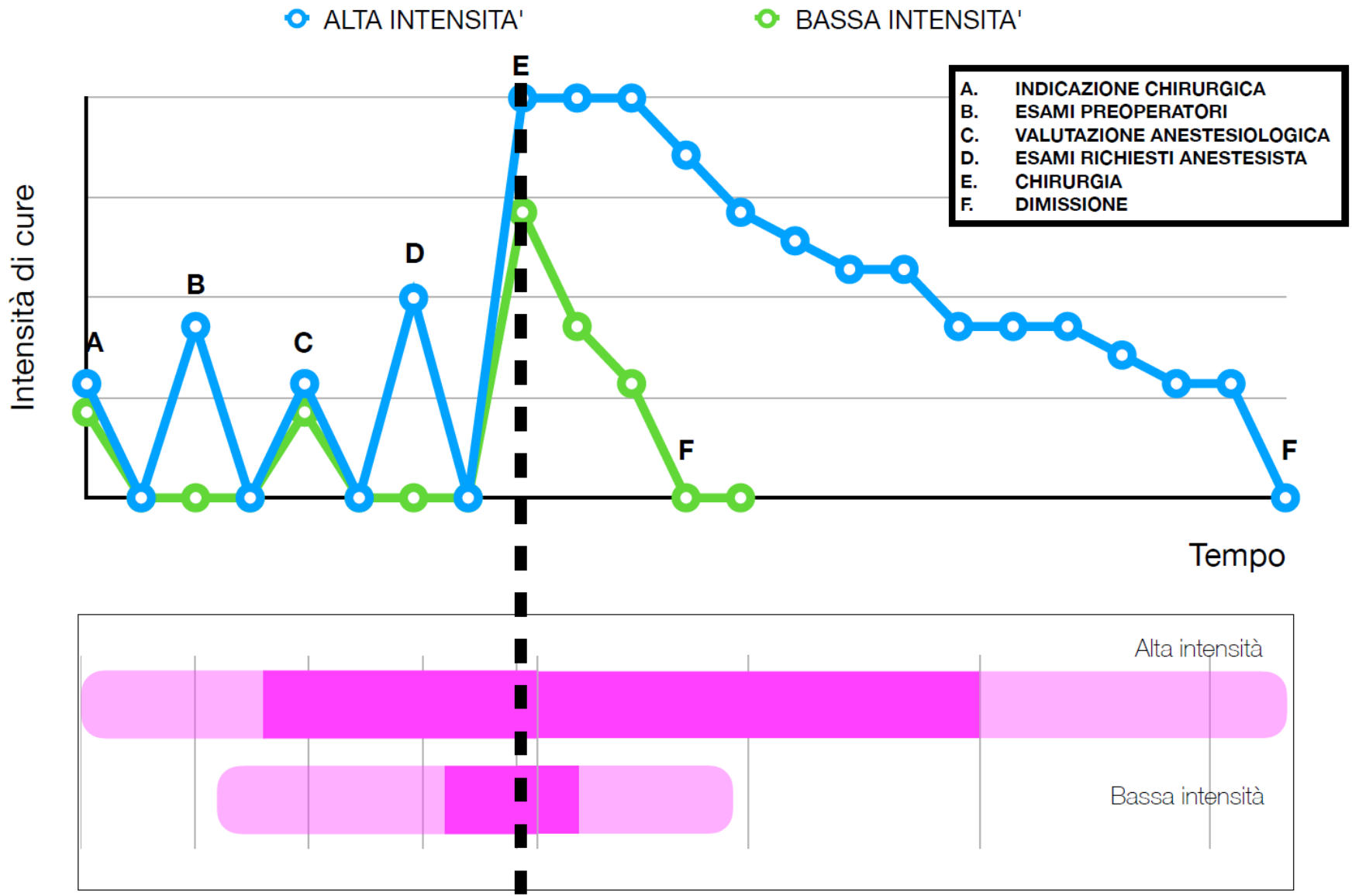
Facile utilizzo
Facilmente utilizzabile da
tutte le figure coinvolte



Sicuro
Processi sicuri di storage
dei dati

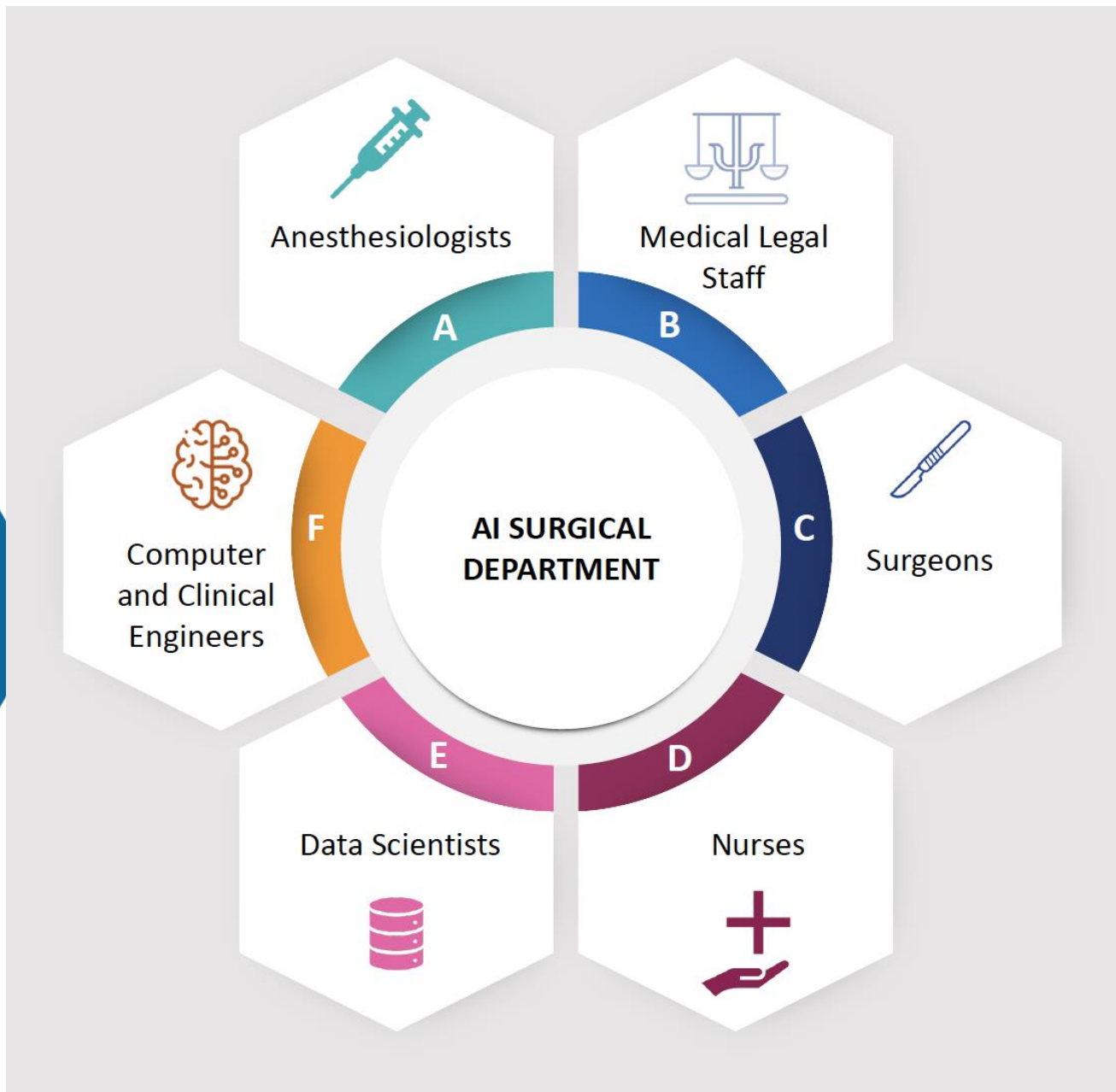


Accesso
Chiave di accesso
differente per le diverse
figure coinvolte



■ TEMPO TRASCORSO IN OSPEDALE CON TELEMEDICINA
 ■ TEMPO TRASCORSO IN OSPEDALE SENZA TELEMEDICINA

**IMPATTO della
Tele-Medicina
sul work flow
peri-operatorio®**





Artificial Intelligence for Personalized Perioperative Medicine

Monitoring Editor: Alexander Muacevic and John R Adler

[Elena Bignami](#),^{✉1} [Matteo Panizzi](#),¹ and [Valentina Bellini](#)¹

AI is bringing about a real technological revolution. As witnesses of this era and healthcare professionals, we have the moral obligation to govern this transition, allowing an ethical and sustainable development of these technologies and avoiding being overwhelmed by them. If managed well, these tools can lead us to an increasingly personalized perioperative medicine, capable of improving quality and safety for patients while enhancing the human side of our profession.

The power of evolution cannot be contained, so let it be

Marco CASCELLA¹, Valentina BELLINI²,
Jonathan MONTOMOLI³, Elena BIGNAMI^{2*}

Minerva Anestesiologica 2023 mese;89(0):000-000
DOI: 10.23736/S0375-9393.23.17484-0

*... «AI&NT will not replace MD.
However, those MD that use AI&NT
will replace those that don't»*